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ILLUMINATING ENGINEERING

Journal of the
ILLUMINATING ENGINEERING SOCIETY

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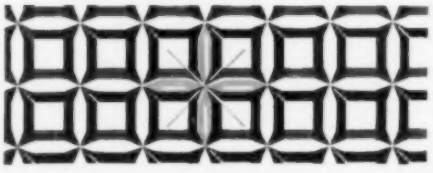

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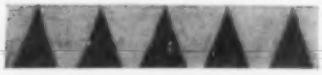

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

September 1957

Vol. LII, No. 9

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Contents

441 The President's Report — Marshall N. Waterman

444 The Vice-President's Report — Kirk M. Reid

450 Light Sources — Conference Paper Abstracts

455 Applications — Conference Paper Abstracts

468 Street Lighting — Conference Paper Abstracts

473 Daylighting — Conference Paper Abstracts

477 Photometry and Colorimetry — Conference Paper Abstracts

481 Calculations — Conference Paper Abstracts

485 Research — Conference Paper Abstracts

491 I.E.S. Lighting Data Sheet — Series XXII
Lighting an Airport Parking Area (27-7)

493 Lighting for the Color-Appraisal of Reflection-Type Materials in Graphic Arts

501 I.E.S. Lighting Data Sheet — Series XXII
Lighting a Barber Shop (19-22)

8A Lighting News
Scheduled Events, 17A; List of I.E.S. Fellows, 23A; About People, 61A

29A Sustaining Members

62A New Equipment Data

66A Index to Advertisers

I.E.S. Committees — Refer to April 1957 issue of ILLUMINATING ENGINEERING.

STATEMENTS and opinions in articles and papers in ILLUMINATING ENGINEERING are the expressions of contributors and do not necessarily represent the policies or opinions of the Society. Official Society opinions are expressed only in official committee reports specifically approved by the Council of the Illuminating Engineering Society.

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General Electric says:

"On the average, only 1 out of 100 G-E Lamps will burn out during the first year of service in a single shift operation."

Harold Kilburg, electrical contractor, says:

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MR. KILBURG (center), president of Kil-Bar Electric Co., Chicago, inspects one of the G-E Lamps that has given such excellent service. Leo Carmody (left), wholesale agent salesman, and Larry King, G-E Lamp Salesman, worked together on this installation.

Cost of light is about 10 times the cost of the lamps. It is also the cost of the electricity used . . . and the cost of maintaining the system. If you specify lamps with unpredictable life, your customers will have lots of early burnouts. But G-E Lamps have a uniform life with few early burnouts. This means G-E Lamp users can schedule an economical group relamping program (replace all their lamps at the same time) and realize big savings in maintenance that far outweigh the little light left in the lamps. For full information on this way to improve your customers' lighting and save them money, too, write: General Electric Co., Large Lamp Dept. IE-9, Nela Park, Cleveland 12, Ohio.

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Pleasant place to make a deposit or withdrawal, don't you think? It's the People's National Bank & Trust Company, Levittown, Pennsylvania. Two of our newer type fixtures were used for illumination.

The public or main area utilizes Litecontrol No. 6142TS-66 fixtures on 8-foot spacing, in a grid type ceiling. Note the even quality of the lighting — only a suggestion of a shadow appears under the checkwriting desks. (Note, especially the long, right-hand desk, designed by the architect. It has no visible support except the lally columns.)

The adaptability or flexibility of this system is apparent. Note how the inverted aluminum T-bars run across the main ceiling down the side of the soffit over the Tellers' counters, and continue to the wall as an integral part of the *Luminons* Ceiling. This is a bank installation, but the concept makes a good, modern system for almost any interior.

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AREA SHOWN:
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INTERIOR DESIGN:
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John Brennen, Trevose, Pa.

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President's Report

By MARSHALL N. WATERMAN
President, 1956-1957

THE REPORT by your Officers will be in somewhat different form from previous years.

First, as President, I shall report on some of the over-all activities of the Society, particularly in relation to broad policies. I will also give some general recommendations for consideration this coming year. Next, your General Secretary, Dick Slauer, will report as the business manager of the Society. He will tell you about key facts in our growth and operation. He will give you a few statistics on our financial progress and report on the work at headquarters. Senior Vice-President and your President-elect, Kirk Reid, will then speak to you about technical programs and accomplishments. This is in line with the specific assignment of the Senior Vice-President to administrative watch over the Society's technical work during the year. He will also present comments looking forward to his presidential program.

As many of you will realize, the occasion of the National Technical Conference is the only time during an I.E.S. year when any large segment of the membership meets with all of the national officers. Theoretically there should be another opportunity at the official annual meeting of the Society which is held, according to the requirement of the present constitution, in October. In practice, however, our annual meetings for some years have been essentially a formality, with very few members on hand other than the officers themselves. Some of us have been considering the possibility in the future of providing at least a brief opportunity for any member of the Society to address questions, criticisms, or proposals to the officers during the Conference opening-session report. Such discussion might be conducted in somewhat the same way as is done at meetings of corporation stockholders.

At present this is just an idea for the future. There is no time allotted this morning for discussion from the floor, but on behalf of all of the officers I am taking this opportunity to invite all of you to speak to us during the week, or to write to us, about this proposal or about any question concerning the Society. In addition, you are invited to attend the first Council meeting for 1957-58 which will be held in this hotel on Friday. This may afford many members an opportunity to observe how the national administration of the Society is carried on.

Mr. Reid, Senior Vice-President, and Mr. Slauer, General Secretary, will be identified to you as they speak following me. In case you do not know the other officers when you see them I will now ask George Taylor, Junior Vice-President, and Joe Browder, Treasurer, to rise and show themselves to you. I speak for all of the officers when I say that we solicit and shall weelome your ideas.

Basic to any strong organization are its guiding policies and precedents as set forth in its constitution, its by-laws and in policy decisions made by its governing board. Recognizing this, your officers this year undertook to encourage the Committee on Constitution and By-Laws to carry to conclusion a major rewriting of these documents . . . a project

recommended and started by previous administrations. I say "re-writing" rather than "revision" or "change" because the work has been primarily that of putting the existing excellent precepts into more consistent, clearer, and therefore more usable form in relation to a large and mature Society, entering its 52nd year. Frank Dean, Chairman, the members of the Constitution and By-Laws Committee, and also the Council and Council Executive Committee have spent many hours on this program. When you see the results in a membership ballot, probably next April, I am sure you will recognize the value of the work. The Procedures and Policies Committee has added to our body of policy this year with a number of well-considered statements for Council action. I might mention, particularly, the "wrapping up" of a long-debated guiding statement on the definition and publication of transactions.

Several actions have been taken during the past year under a broad policy directed at stimulation of interest among college and high school students in illuminating engineering as a career and as a vital part of the design of useful and beautiful indoor and outdoor areas. A Task Committee on Student Branches, under the chairmanship of Past-President Walter Sturrock, was appointed and has already started its work of collecting and spreading ideas for the encouragement and nurture of Student Branches of I.E.S. in universities and colleges.

Your committee on Education has made some progress in the drafting of a pamphlet designed to be placed in the hands of school and college teachers and their students. This will give information about illuminating engineering as a worthwhile subject for study and for consideration as a career. I hope the pamphlet can become available during next year.

Still another activity designed to interest young men and women in lighting is the Allied Arts Program — student contests in design and lighting, sponsored by I.E.S. Sections and Chapters in collaboration with schools and societies of architecture and decoration. The officers and your national committee, under the enthusiastic chairmanship of Karl Staley, have sought to stimulate enlargement of this program this year. The results will be reported to you separately at this Conference.

I know you will share my feeling of pride on behalf of the whole Society in reporting to you certain accomplishments of the publications program. First, I shall mention the winning of a national Award for Editorial Excellence. In the Nineteenth Annual Competition for Editorial Achievement, conducted by *Industrial Marketing*, the business paper for magazines, ILLUMINATING ENGINEERING was judged a winner, for "best original editorial research" in connection with the feature "Fifty Years of Significant Development in Lighting," published in the January 1956 issue. I might mention that the competition included some 653 entries. All concerned with that issue should take pride in this national recognition of achievement, and that includes the 100 or so members of I.E.S. who participated, working for over a year in the development of the valuable material published in our commemorative issue.

Aside from prize-winning I want to commend the Publications Committee and the staff for the continued healthy growth in value of our magazine, the useful dissemination of Data Sheets and other publications, and for accomplishing this at a cost to each member which is less than ever before. I should like to name the following three people so that you can give them a round of applause after I introduce them all to you and get them on their feet:

Joe Schuchert, the Chairman of the Publications Committee for his leadership and for the vital support given to the magazine by the committee.

Clayt Ellis, whose excellent promotion of publications sales and advertising is one of the reasons we can have such a good magazine.

Ruby Redford, editor of ILLUMINATING ENGINEERING. Will you three please rise and take a bow.

To switch to quite a different area of consideration, I should like to mention the beginning made this year on a program directed at more efficient use of the time and travel contributed to the Society's work by the members of Council. These are — the Directors, the Regional Vice-Presidents and the other officers. In my remarks before the National Technical Conference a year ago, I emphasized the need for such a program to minimize the loss of qualified candidates for our top elected offices because of the heavy impact of their I.E.S. duties on normal bread-winning. During this past year we have taken the following steps:

1. Had our first Council meeting at the location of and immediately following the National Technical Conference, thus saving a trip to New York City in October. We are doing this again here at Atlanta.
2. Held several of our Council Executive Committee meetings on the day or two preceding Council, instead of requiring members to travel to meetings during the month between Council meetings.
3. Handled some of the routine considerations of Council by mail, thus giving more time for discussion of policy matters.

This may seem a bit remote to some of you, but I

think this program is a most important one because it involves the future supply and calibre of your officers. As the work of the Society expands, the burden on the officers increases and an intelligent look ahead requires action to keep the burden from becoming excessive.

Speaking of the labors of National Officers leads me to acclaim the tremendous work and accomplishment for the Society contributed by the Regional Activities Committee made up of the eleven Regional Vice-Presidents and chairmanned by George Taylor, the National Vice-President you elected last year.

The Regional Vice-Presidents not only accomplished much during many hours of travel and discussion time within their respective regions, but they also participated in Council meetings and, what is more, spent a full day or day and a half in Regional Activities Committee sessions prior to each Council meeting. Much good has come from these meetings — more than either I or Dick Slauer can recite to you this morning. I should like to mention one outstanding contribution — a study of the opportunity for new I.E.S. Chapters in the United States and Canada in terms of population and trading areas. This report, prepared by a task group of Regional Vice-Presidents, headed by Nelson Warner, has given us a most valuable guide for a planned expansion program.

Those of you who may have heard me speak at one or more of the Regional Conferences (incidentally, Mrs. Waterman and I were delighted by all nine of them) will not be surprised at my inclusion here of a word about research to gain more knowledge of lighting and seeing and about the work of the Sustaining Membership Committee under Fred Guth. The latter committee has continued to stimulate additional funds for the program of the Illuminating Engineering Research Institute. Kirk Reid will tell you more about this work. I shall simply say that my observations during the year convince me very strongly that the accomplishments this year through several accelerated researches in both quantity of light and quality of lighting are most eminently worthwhile. Furthermore, I am convinced that there is real need for a continuing and expanding program to fill many remaining gaps in our knowledge of lighting and seeing. This knowledge we must have to serve the public and to serve you, the members.

This is my brief report on just a few highlights of accomplishment during this past year. Now I should like to present a few recommendations for consideration next year.

1. First, I recommend continued emphasis on activities which will interest students in the art and science of illuminating engineering. In competition with the glamour and immediacy of engineering for jet airplanes, guided missiles, satellites and many other exciting fields, the less dramatic but broader pursuit of lighting for all people will not get its share of talented men and women unless we use every means to commend to them the fascinating human, artistic, scientific, and universal challenge of our profession. Let us not sell lighting short! The power for good of ten thousand plus illuminating engineers working in and through our Society makes our story a proud one which should be told to the young men and women about to choose and embark on their life work.

2. My second suggestion has to do with broader participation in technical and general committee work by qualified persons located in the geographical fringes of this continent. In my travels this year I became convinced that there are many such people, able and willing to contribute to national committee work although obviously limited to some extent in ability to attend numerous meetings held in the center or northeast portions of the continent. The problem of off-setting this limitation is neither new nor simple. However, I am sure that ways can be found to make a stronger Society by adding some form of participation of these distant members. This might be through area committees or corresponding groups, or sub-committees, or in some other way. I recommend a study be made of ways and means, and that a trial be made of the best.

3. Another recommendation is that a strong effort be made to develop material for use at Section, Chapter, and Study Club meetings. The purpose of such material would be to add to the interest in the meetings, stimulate greater attendance, and increase the educational value of the programs. I have in mind sets of slides and charts, tape recordings or exhibits around which alert program chairmen could build lively discussions. The need for such a project became apparent to me as I listened in on discussions of local activities all over the country during this past year.

For example, when a new Recommended Practice is issued the salient charts and tables might be made available in slide form along with a tape or disc recording done by our Technical Director, Cash Crouch, or the Chairman of the technical committee or both. The recording would provide explanation and discussion. This idea is just to indicate one possible approach. I am sure that other ideas can be developed and that something useful can be provided. I therefore recommend action by appropriate committees.

(continued on page 449)

Vice-President's Report

By **KIRK M. REID**
President, 1957-1958

As PRESIDENT Waterman indicated, my report covers highlights of the *technical* work accomplished during the past year. This technical work has been carried on under two auspices. One is the Society itself, with more than eighty technical committees, subcommittees, and task groups. These have been engaged in lighting application studies, preparation of recommended lighting practices and other forms of reports and services. The other is the Illuminating Engineering Research Institute, supported largely by the Society but separately administered, because of its specialized scope, by its own Trustees, Research Executive Committee, and Technical Advisory Committees. The Institute, through its research contracts with leading universities and colleges, has been adding importantly to fundamental knowledge on which our lighting practices are based. So, while these two areas of technical activity are closely coordinated, it is proper for me to report them separately.

Illuminating Engineering Research Institute

The work of the Illuminating Engineering Research Institute might be described as a crusade for lighting truth. The Institute researchers are seeking to find, very broadly, how light affects human beings. Their studies cover basic principles of all phases of light in its relation to human living. Let me simply say that these researches have been producing some startling and thrilling findings, with profound implications to our Society, to the lighting industry, and to lighting users.

A Research Symposium was held at Ithaca just before the 1956 National Technical Conference at Boston. There all the Institute researchers on quantity, quality and color were brought together to report and discuss the progress they had made to date. The registration of over a hundred included many of the key officers and members of our Society's technical committees. This Symposium was a great success. We in the Society have encouraged the Institute to hold such Symposiums periodically —at intervals of not more than two years—so that our members can have prompt first-hand access to developments that are making lighting history.

Quantity of Illumination

Recently committees of the Society have been concerned about recommendations of footcandle levels for offices, schools, industry, and several other lighting fields. Review of our footcandle recommendations is needed for practices which are under revision and for the current revision of the *IES Lighting Handbook*. Appeal was made to the Research Institute to see if any of their available or prospective research findings are applicable to this matter.

Accordingly, visual discrimination data of Dr. H. R. Blackwell's studies at the University of Michigan over the past several years have been assembled and analyzed. This material has evoked considerable interest and enthusiasm. Further, Dr. Blackwell has proposed that the time has come to correlate laboratory discrimination data with per-

formance of actual tasks — as in industry, for example. He is in process of building a mechanical setup which will deliver inspection tasks at predetermined rates. At various illumination levels and inspection rates the observers will attempt to discover in round disks certain defects which have been designed into the disks. The results of this "work performance" study, together with the previous laboratory "eye performance" studies should provide a better basis for determining proper recommendations of illumination levels than has heretofore been available.

It is expected that the Research Institute will hold another Symposium shortly after the first of the year to present and discuss the completed results of these and other "eye performance" and "work performance" studies. This new information will then serve as a basis of new footcandle levels in the Handbook and in our Society reports.

Studies of Discomfort Glare

To see tasks efficiently and comfortably there must be suppression of glare. Much work has been done on evaluation of discomfort glare. For simple environments, one might say that the relationships between cause and effect in discomfort glare have been established. Much more needs to be done to make glare criteria applicable to actual, complex luminous environments. Dr. Glenn A. Fry and Dr. Jack M. Fugate of Ohio State University are continuing to study this problem. They are now engaged in determining the relative glare effect of "hot spots" on luminaires. Previous work has assumed uniform brightness of luminaires, whereas in actual environments the luminaire brightness is often non-uniform.

The need for data on discomfort glare at low adaptation levels—for example, in street and highway lighting, and airport lighting—prompted Prof. R. C. Putnam of Case Institute of Technology to request sponsorship of a study to determine the effect of *multiple* sources in the field of view. He had previously measured the effect of a single source at varying positions. This study has now been completed and the results are being reported at this Conference.

Losses of Contrast Due to Specular Reflection

Many papers for ink and pencil in schools and offices have been considered to be non-glossy and therefore immune to reflections of overhead luminaires in their surfaces. Further, little attention has been paid to the specular components in ink and pencil marks. Recently it has become recognized that there may be appreciable losses of contrast due to these reflections. Using the contrast threshold meter developed by Dr. C. L. Cottrell of Cornell University, John Chorlton and Hedley Davidson measured the reductions in contrast between the writing and its background. Due to the controversial nature of this subject, and its importance in office and school lighting recommendations, the Research Institute sponsored a similar study at the University of California by Prof. D. M. Finch. Work is well along and the results are expected soon.

Visibility in Fog

A startling demonstration of ways to break through the haze barrier in fog at night was presented recently at Penn State University. Prof. Charles Marsh of that University and Prof. B. S. Pritchard and Dr. H. R. Blackwell of the University of Michigan worked jointly on this problem. They found that if roadway lighting is directed substantially perpendicular to the line of sight, haze from the lighting in greatly reduced. A motorist can then "see through" the fog with fair visibility of roadway markings and obstacles. Further, if the light from either the roadway luminaires or the car is polarized, the haze becomes much less pronounced and visibility is greatly increased as the motorist look through the cross-polarizer. These findings may result in much greater usefulness of turnpikes and expressways under conditions of fog at night — and a great saving of life.

The Society's Technical Program

The Society's technical program continues from year to year with all the vigor of a dedicated effort. There seems to be no limit to the devotion of our technical committees. They take in stride long hours of concentrated effort and almost painful redoing of draft after draft 'til the reports represent the best that united effort can produce. We stand unique among professional societies in our production of Society reports through *group* effort. In other societies, the emphasis appears to be on *individual* contributions — published papers by one or two or sometimes three authors. We have that, too. But nowhere else, to my knowledge, does a professional society have so many committees working so wholeheartedly to produce understandable, usable reports. There are usually real problems in assembling all pertinent facts upon which to base a report. Sometimes there must be an appeal for a research to clarify some fundamental point. But when the labors are finished and agreement reached the rewards are great — in satisfaction to the participants, and in appreciation by lighting users and the lighting industry.

This year our technical committees have been asked to undertake increased activity — not only to produce reports, but also to revise the material in the *IES Lighting Handbook*. This latter is a tough job by itself, trying to condense our collective knowledge into a few words and yet provide readers with a clear understanding.

Let's talk about the reports produced this year.

Daylighting

Daylighting can be good! It can be bad! How do we know until we measure it? The Daylighting Committee has developed a new report, "Guide for Measuring and Reporting Illumination from Daylight." This guide tells what measurements should be made, and how and where, not only within a test room but also of the related incident illumination outdoors. For the first time, here is a pattern for systematic evaluation of daylighting design.

Central Station Properties

Turning to the industrial field, do you know how to light a "burning" platform? Oh, I'm sorry, a "burner" platform. The Central Station Properties Committee has come up with the answer to this and many other lighting problems in the report, "Lighting Indoor Areas of Central Station Properties."

Of course, you have already seen their report, "Lighting *Outdoor* Locations of Central Station Properties," in the February issue of ILLUMINATING ENGINEERING. Let me remind you that the value of this report goes far beyond the central station field. The recommendations apply widely to industrial outdoor areas. In this respect, central station properties are good models. They pose outdoor lighting problems typical of industry, with the further special requirement that the lighting must be dependable whenever the plant is operating — which is always.

All of us are well aware of the benefits stemming from suppression of glare. Here is a report, however, that might seem to take an opposite view. It finds a *virtue* in glare — for protective lighting. In this application, glare serves to blind the trespasser and to conceal the guard. The best sauce for the goose, you see, may not always be the best for the gander.

Graphic Arts

Reproduction of color in graphic arts and printing has been a headache since its beginning. Light from north sky was used in the early days, but even that was variable in its rendition of color. The Graphic Arts Committee, with joint participation of IES and the Research and Engineering Council of Graphic Arts, has just produced its report on "Lighting Reflection Type Materials for Graphic Arts Visual Color Appraisal."

This joint study group squarely confronted the printing industry's age-old problem: After the artist carefully chooses colors that suit the needs of his project, the next task is to transmit those colors to the engraver and printer. This has always been more easily said than done, for we all know how fickle colors are — as the light source changes, so do the colors. All too often, under the engraver's "casual lamp light" the pigments that were just right under the artist's north light suddenly become entirely wrong. And this is not the end of it. For even if the engraver finally "sees" the color as the artist did, the printer is likely to be foiled by the very same villain—"casual lamp light"—when he comes to reproduce the colors on the printed page.

Today is a happier day for the long-suffering engraver and printer—and the artist too—thanks to these joint studies of the lighting and printing industries. Today the quality of north-sky light need no longer vanish with the coming of dusk, nor turn up absent on a gray, rainy day. Today, with light from a typical north sky measured and its qualities captured in standardized filter-controlled lighting, north light can be with the artist, the engraver and the printer around the clock. This report prescribes a remedy for their mutual chronic headache.

Sawmills: Redwood Green Chain

Did you know there are 41 defects to catch in redwood lumber? Take a look at the July issue of ILLUMINATING ENGINEERING. See the neat solution for the inspectors to see clearly and quickly as they check 20-foot boards travelling by them at 30 feet per minute.

Theater and Television Lighting

The Theater and Television Committees teamed up with the Society of Motion Picture and Television Engineers. Together they developed the long-needed "Recommended Practice for Reporting the Photometric Performance of Filament Lighting Units Used in Theaters and Television Production."

Nomenclature

"Three little words" have a world of meaning in a one-time popular song. The Nomenclature Committee is making sure the words we use in lighting practice have the *right* meaning for the users and the engineers. New segments of our nomenclature coverage, including color and aviation terms, have recently been approved by Council.

Quality and Quantity

Now the long-awaited report on brightness limitations, or discomfort glare, has come bursting from its stalemate in the Committee on Standards of Quality and Quantity for Interior Illumination. Report No. 6, "Avoidance of Direct Discomfort Glare in Designing Lighting Installations," marks an epochal development in the struggle for better quality of interior lighting — less distraction and annoyance from glare. Here the long-recognized objective is to minimize glare — the same glare that we have acknowledged as a boon to protective lighting. But how to proceed? What limits to set?

Now the basic technical data are established. There remains the task of interpreting this authoritative report in form suitable for use in our recommended practices. This will not be easy. When done, it will add another important step toward specification of lighting that is keyed to user satisfaction — that is moving constantly toward "perfection."

Street Lighting

No longer will we "black out" in tunnels and underpasses, hoping nobody else is there. Now "we shall see" according to the latest report from the Street and Highway Lighting Committee in their recently published "Lighting for Tunnels and Underpasses."

Testing Procedures

Do we know? Can we measure? The Testing Procedures Committee is making mighty sure we have our facts from uniform methods of measurement. It is a major achievement that *three* Guides have been produced this year:

Guide for Photometric Testing of Searchlights

Guide for Photometric Measurement of Fluorescent Lamps

Guide for Photometric Testing of Outdoor Fluorescent Luminaires

Education

The cry, from every segment of the lighting industry, is for more manpower — *young* manpower, interested in lighting and with some educational background in lighting. The Lighting Education Committee has completed a major revision and expansion of "Experiments with Light." We believe these experiments, in high school physics courses, will stimulate lighting interest among boys and girls with attendant influence on their plans for college and for careers. Consultations are now in progress with the National Education Association and the Better Light - Better Sight Bureau to determine the most effective way to publish and distribute this material.

Other Technical Activities

The foregoing brief comments about our technical committee activities have been directed to those reports completed during the past year. Acknowledgment should be made of the many other activities of our technical committees. These include conduct of special meetings, for example those outstanding conferences of the Aviation Lighting Committee, consultation with Research Institute investigators and with other organizations, and, as previously mentioned, major revision of Handbook material.

The President's Recommendations

President Waterman asked me to present comments looking forward to my presidential program. He also made five recommendations. They are directed to those areas of our Society operation where, in his judgment and experience, we have the most need and the greatest opportunity for improvement. With characteristic foresight and thoughtfulness, he submitted these recommendations to the incoming officers some weeks ago. We have studied them and have had preliminary discussions of them. Hence I can outline to you the steps we taking to carry them out.

First, let me recall with you that some years ago it was the practice to have a Committee on the President's Address. That Committee at the close of the National Conference presented a report on the President's Address. Their report dealt in part with the President's recommendations, although they were often handicapped by time limitations during a busy conference week. More recently, instead of such a Committee, it has been the practice to have discussion of the President's recommendations by the Executive Committee and Council, with appropriate action on each recommendation. That practice will continue with President Waterman's recommendations. Meanwhile my comments now on those recommendations will indicate to you the influence they are already having on our plans for 1957-58.

Recommendation No. 1

President Waterman's first recommendation calls for increasing attention to students, to interest them in lighting as a career. This recommendation is affecting the programs of several of our activities. Here are four examples:

(a) The Lighting Education Committee, with Alston Rodgers as the new chairman, is meeting this week. They will consider proposals, drafted by Mr. Rodgers and retiring Chairman H. H. Magdsick and me, of a program of activities expanding

substantially upon the fine work done by this Committee in the past.

(b) Certain of the Lighting Education Committee proposals involve later action by other Committees — Publications, Public Relations and Information, and probably Finance.

(c) The Allied Arts Committee, with Karl Staley as Chairman and Jerry Whitnell as Vice-chairman, already can promise more and better student competitions next year than ever before.

(d) A new Student Branch Committee, still in process of organization, will have the assignment of increasing and strengthening our Student Branches. The pattern for this work is set forth in the recent report of the Task Committee on Student Branches, under Walter Sturrock's chairmanship.

Recommendation No. 2

President Waterman's second recommendation urges broader participation in our national committee work by members living in geographical fringe areas. We *must* find ways to make better use of this talent. We are doing three things:

(a) We are asking all Sections and Chapters to make objective reviews of their members capable of contributing to national committee activities and willing to serve. Already we are receiving some carefully considered nominations. Realistically, we will not be able to appoint all such committee nominees. But, as one accomplishment of this activity, you will find on our national committees a substantial increase in members from the West Coast, southwest, mountain states and Canada.

(b) We are trying a new classification of committee members — Advisory Member — in our Street and Highway Lighting Committee. An Advisory Member will receive meeting agendas, is expected to submit written comments, is invited to attend meetings if he can but without obligation to do so, and will receive minutes. Dana Rowten, incoming Chairman of the Street and Highway Lighting Committee, reports an enthusiastic response to this Advisory Member classification from many who are interested and qualified but can seldom attend meetings. Perhaps some other committee chairmen would like to give this a try. A year from now we can tell you how it works out.

(c) We are asking technical committee chairmen to pay particular attention to the possibilities of local Task Groups or Sub-committees to whom specific assignments can be given. We have had several such groups, and they have done fine jobs; now we want more of them. For example, W. H. Kahler, Chairman of the Industrial Lighting Committee, is asking J. G. Felton of Dallas to chairman a subcommittee on Lighting for the Aircraft Industry. That industry, as you know, is located largely in the southwest and along the West Coast. We are also asking local groups to volunteer their services on lighting projects that may be of special interest to them. I invite all of you to keep in mind that group volunteers for special projects will be welcomed.

Recommendation No. 3

President Waterman's third recommendation deals with development of material for use at Section, Chapter, and Study Club meetings. I understand that Vice-President Joe Browder will submit this proposal for special consideration by the Regional Activities Committee, of which he is Chairman.

Recommendation No. 4

President Waterman's fourth recommendation is that we include biographical data with our ballots on national and regional officers. Of course we should. Endorsement by Council should suffice to put this recommendation into effect. It will be docketed for Council action.

Recommendation No. 5

President Waterman's fifth recommendation urges further attempts to reduce the requirements of time and expense now imposed on our national and regional officers. This problem becomes more acute as the Society grows in size and in variety of services rendered. It merits the thoughtful, continued study of all concerned. Just two comments now. First, in 1957-58 we expect to continue handling of routine Council matters by correspondence. We also expect to combine dates of Council and Executive Committee meetings where practicable. The first Council meeting of the new fiscal year is being held here in Atlanta on Friday, September 13, instead of requiring a special trip to New York in October. We shall take a good look during the year at our Council and Regional Activities Committee meetings to appraise the gains and losses if we should hold four instead of five meetings a year, as President Waterman suggests. At the end of the year our objective is to have a considered recommention to submit to the next administration.

Society Headquarters Location

Here is an entirely different question, related to our I.E.S. future: Where should our Society Headquarters be located? New York? Cleveland? Chicago? Denver? Some other city? During the past three years there have been preliminary studies and discussions by Advance Planning, Regional Activities, and a Task Committee on Headquarters

Location. This was timely because of the studies then in progress on location of the proposed new United Engineering Center. Our preliminary work served principally to show that several factors must be weighed in arriving at the best overall choice.

Now the United Engineering Trustees have reached a decision. The new United Engineering Center, a $10,000,000 project, will be in New York City. It will be located on First Avenue, extending from East 47th to East 48th Streets. This portion of First Avenue, in the vicinity of the United Nations Building, has been renamed United Nations Plaza. Our Society has been asked for a prompt decision whether we will want space in this United Engineering Center, beginning in 1960.

Accordingly I have reactivated the Task Committee on Headquarters Location, with a new statement of scope. It reads: "To study all factors affecting choice of future location of our Society Headquarters and to submit a recommendation to Council." As members of this Task Committee I have appointed, subject to Council approval, L. E. Tayler, Duncan Jones, John Walsh, Jerry Whitnell, and M. N. Waterman, Chairman.

What a job they have. They deserve the full cooperation of all of us — individuals and committees — of whom they may ask information or consultation. I know they will receive such cooperation.

Conclusion

In quick review, I have commented on four general subjects — (1) the vital studies of the Research Institute, (2) the broad and vigorous technical program of the Society, (3) President Waterman's excellent recommendations and our 1957-58 program reflecting those recommendations, and (4) our all-important immediate problem of Headquarters location. Within the time available this morning, these appeared to be the subjects most worthy of discussion.

Among the diversified activities of our Society, there are obviously many other things about which I might have talked. There are many other individuals and Committees deserving tribute. Speaking for all of our officers and members, I acknowledge our indebtedness to all of you who have helped to make 1956-57 a year of noteworthy accomplishment. While this acknowledgment is collective rather than individual, it is no less sincere.

In closing, let me extend personal thanks for the honor you have conferred upon me in electing me your President for the coming year. I shall try to fulfill the duties of that office to your satisfaction. And I shall try to be available in any way I can for services to the Society and the Lighting Industry.

President's Report — Waterman

(continued from page 443)

My next recommendation is a procedural one relating to our national election ballots. It is simply that these ballots be accompanied by a biographical sketch of each candidate. Even though our national ballot lists only a single slate it seems to me that our voting members, many of whom cannot know the candidates personally, are entitled to these biographies as a matter of good democratic procedure. In addition I believe the biographies will have value and interest to our members as a means of closer acquaintance with their officers.

Next, and last, I recommend continued effort toward reduction in the time and money required of national officers and Regional Vice-Presidents in serving the I.E.S. I have already discussed steps taken during the past year. I believe that more can be done. For example, I am not at all sure myself that we need five meetings of Council each year. I believe that with better organization of administrative procedures, more handling of routine matters by mail, and more comprehensive headquarters functions, we could serve the Society members as well or better than we do now with four quarterly meetings. These might be in September, December, March and June. I think there are other directions also in which operations might be improved while reducing travel, time, and financial burdens on officers. I therefore urge further study by the officers and appropriate committees such as Advance Planning and Regional Activities.

This brings me to the end of my recommendations. In concluding I want to say to you, most sincerely, that it has been an exciting and pleasant experience to be your president. I leave the task more convinced than ever that I.E.S. is very worthwhile and is deserving of the best its members and officers can give to it. Thank you for the opportunity, the honor, and the friendliness you gave me.

Abstracts of
I.E.S. Conference Papers on

Light Sources

Design and Characteristics of Fluorescent Lamps Having a Non-Circular Cross Section

J. O. Aicher

E. Lemmers

It is desirable to increase the light output available from the fluorescent lamp without appreciably reducing efficiency. This paper describes how this goal has been achieved.

The ability of small diameter fluorescent lamps to withstand a given percentage increase in loading with less de-rating, lumen-wise, than large diameter lamps has resulted in a study of fluorescent lamp geometry. This work has indicated that close proximity of the bulb wall (phosphor) to the arc is very beneficial in that ions and electrons are lost to the bulb walls at a greater-than-normal rate. This loss curiously results in a gain in performance of the lamp for a number of reasons:

(1) A higher lamp voltage is established which is very advantageous in increasing lamp wattage at reasonable currents, in decreasing electrode losses, and in permitting use of smaller, lighter, cheaper and more efficient ballasts.

(2) Electron temperature is increased, resulting in more effective production of the necessary exciting ultraviolet energy.

(3) Energy losses, which occur in the arc of all fluorescent lamps, and which limit efficiency, are reduced.

The net effect is to make possible the delivery of more ultraviolet radiation to the phosphor, with low losses, resulting in a much larger package of light at high efficiency.

Although ions and electrons can be lost or "trapped" on internal structures of many forms, it has been found that, from a light emission standpoint, the best trap is the bulb wall itself. Trapping at the bulb wall can be enhanced if the ratio of wall area to discharge volume is increased. At constant efficiency it has been found that lamp wattage can be increased approximately in the ratio of $C^2/A^{0.75}$, where C is tube wall circumference and A is its cross section area. This ratio is highest with large tubes of non-circular cross section.

Such geometry is compatible with the use of argon as the starting gas. Use of argon facilitates the design of cathodes, using present technology, necessary for good lamp life; it keeps wattage losses at the cathode at a low value either as direct heating energy or as arc losses.

A commercial non-circular cross section lamp has resulted from modification of the T17 size tube to form a "U" cross section, interrupted every ten inches or so by a short zone of circular cross section to impart the necessary strength. This lamp has properties similar to a number of small diameter round lamps in parallel, having the good loading characteristics and efficiency of small tubes, yet with the wattage-handling ability of larger lamps.

Authors: General Electric Co., Nela Park, Cleveland, Ohio.

Bulb configuration is responsible for very effective control of mercury vapor pressure by providing cool areas in the positive column portion of the lamp. This bulb configuration and mercury vapor pressure control are valuable in obtaining a high lamp operating voltage and therefore high wattage input and light output at desired operating currents with argon as the starting gas.

(Abstract of I.E.S. Conference Paper No. 12.)

C. J. Bernier

W. C. Gungle

Glow Discharge Characteristics Of Fluorescent Lamps

PRACTICALLY all new fluorescent lamps introduced within the last few years have been designed for rapid-start operation. This circuit has many advantages over the preheat and instant-start circuits but has some deleterious effects on the lamp. Some of the phenomena occurring in rapid-start circuits using high power lamps are discussed in this paper.

The starting cycle for the series sequence circuit was studied with emphasis on the glow phase — the time interval between initial ionization and arc operation. During this interval some cold cathode emission occurs and the cathode fall voltage is sufficiently high to cause sputtering of metal surfaces by ion bombardment, in any fluorescent lamp operated on this circuit. These sputtered materials will plate the emissive material on the filament, resulting in decreased electron emission.

The magnitude of the current during the glow phase is a function not only of the external circuit but also of the available cold cathode area. The time duration of this glow depends on the volt ampere characteristic of the cathode heating circuits of the ballast as well as that of the arc circuit.

Factors which contribute to making the glow phase more significant in recent lamps are: (a) lower fill gas pressure, (b) lighter rare gas fill — such as neon — and (c) larger anode area.

Cathode fall measurements made at different intervals of lamp life indicate the change in cathode emissivity. Curves of cathode fall initially and

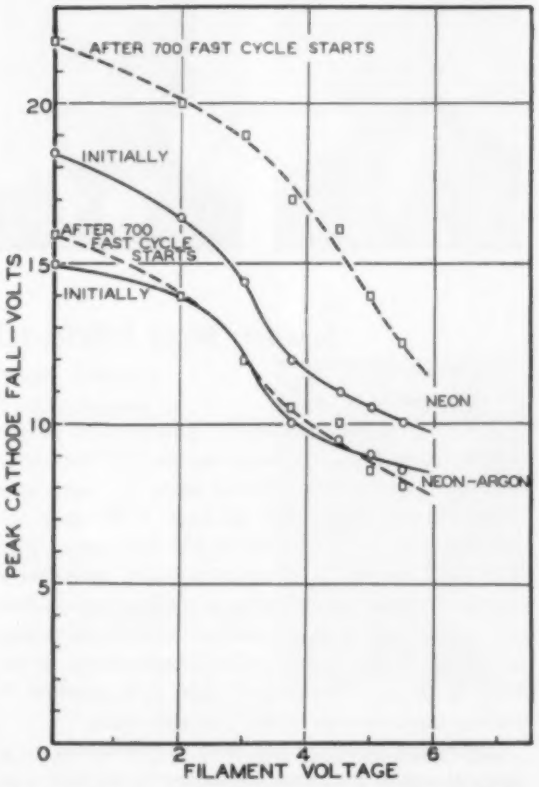

Figure 1. Curves of cathode fall as a function of filament voltage initially and after 700 "fast cycle" starts for 1.0 mm neon fill and 1.0 mm 80 per cent neon/20 per cent argon fill.

AUTHORS: Sylvania Electric Products Inc., Danvers, Mass., and Salem, Mass.

after 700 starts for two different fill gases (neon and a mixture of neon and argon) are shown in Fig. 1, and indicate that the maximum cathode fall is reduced significantly by the presence of a small quantity of argon. In addition, this maximum is affected only slightly by 700 fast cycle starts while there is appreciable change with a pure neon fill. This difference in cathode phenomena appears to be associated with the difference in probability of inelastic collisions in the two gases.

This reduced cathode fall results in a decrease of energy of ions bombarding the electrodes and a decrease in the amount of metal sputtered during lamp operation.

If exposed metal parts serving as auxiliary anodes are placed in a region of low ion density, little or no metal sputtering will occur. The coil support wires of necessity, being in a high ion density region near the cathode, can be covered with insulating material so that no ions can strike bare wires and cause sputtering.

A better understanding of the role played by the fill gas in cathode phenomena has made it possible to retain the distinct advantages of neon as fill gas with its higher efficiency and lower current, while at the same time inhibiting the effects of higher cathode fall.

(Abstract of I.E.S. Conference Paper No. 11.)

Left to right:
P. B. Jordan
C. W. Pearson
W. H. Fisher

Smaller, More Efficient 100-Watt Incandescent Lamp

THE AXIAL filament construction of the 100-watt incandescent lamp described in this paper locates the coiled-coil filament along the lamp axis (CC8) rather than across the axis (CC6) as in the present general service 50- to 200-watt sizes (Fig. 1). This change in filament position provides a pattern of filament radiation and filling gas convection currents that produces 6 per cent greater mean light output and lower socket temperatures in the same bulb size. Because of this, it is possible to reduce the bulb size of the 100-watt lamp.

Extensive development work has resulted in a lamp that also performs satisfactorily on tests that represent shipping and service conditions. The change in construction requires a redesign of the filament to take advantage of the higher temperature at which an axially mounted filament can be operated in a vertical lamp position without sacrificing life. On horizontal burning, there is a gain in efficiency at some expense of life. However, inasmuch as surveys have shown the preponderant usage of the 100-watt lamp in a vertical position, the axial filament construction provides its maximum performance in the most prevalent conditions of service.

Temperature measurements made in standard critical luminaires showed a sufficiently lower temperature (11 C) with the axial construction to permit a reduction in bulb size. In the smaller bulb (A19), the socket shell temperature of the 100-watt lamp with axially mounted filament showed 122 C

AUTHORS: Large Lamp Dept., General Electric Co., Cleveland, Ohio.

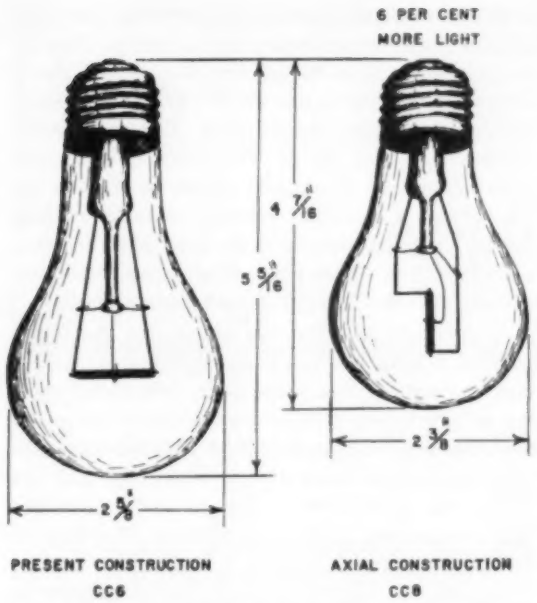

Figure 1. The present 100-watt incandescent lamp and the new axial construction.

as against 120C for the present lamp in its larger A21 bulb. This is still within the 125C socket shell temperature limit, and bulb temperature increases in the smaller bulb are relatively minor.

The axial filament 100-watt lamp in the smaller bulb will be the same size as the 50-, 60- and 75-watt lamp and but three-sixteenths inch longer than the 40-watt. This should provide for a judicious interchange of wattages which will make for flexibility in lighting levels and in fixture designs.

An almost completely uniform light distribution is realized with the axial filament lamp in the plane perpendicular to the lamp axis. The distribution becomes almost symmetrical throughout its 360 degrees. An important advantage of the CC8 construction lies in the fact that the base and socket come opposite the end of the filament where the candle power is inherently lower.

An increase in light output in directions normal to the lamp axis results from both the higher efficiency and the filament orientation. With the new lamp, there is a greater amount of light flux in the region where the controlling materials in a luminaire function best to redirect or modify the light. An example is a specular reflector designed to provide good concentration with minimum uncontrolled light. With the axial filament there will be a larger proportion of generated light directed into the light beam.

(Abstract of I.E.S. Conference Paper No. 10.)

Development of De Luxe Fluorescent-Mercury Lamps For Commercial and Specialized Lighting Applications

William S. Till

Mercury lamps of both clear and color-improved types are used principally for industrial and outdoor lighting applications. The golden-white color-improved fluorescent-mercury lamp, introduced in 1949, provides a marked color improvement as compared to the unimproved variety and has therefore opened up some new fields of use. For many applications, however, a more flattering color balance is desired with a long-life mercury type of lamp. This paper describes the development of "de luxe" fluorescent-mercury lamps and compares their characteristics with those of standard types. It also discusses other possible ways of obtaining de luxe color, using a mercury-type source.

Author: Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J.

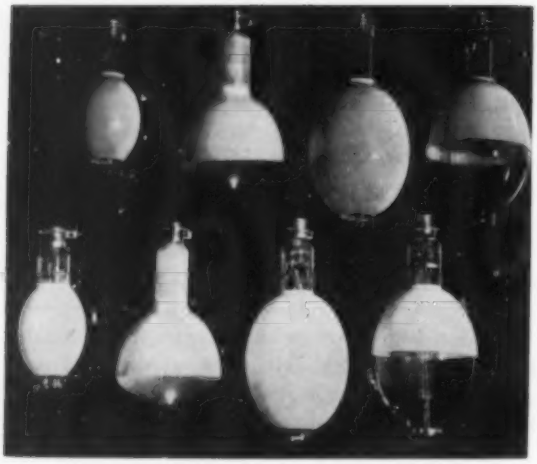

Figure 1. Upper row, group of experimental de luxe fluorescent-mercury lamps: 400-watt BT37, 400-watt R57, 100-watt BT56 and 1000-watt BT56 semi-reflector. Lower row: their standard counterparts: J-H1-WD, P-H1-WD, C-H12-WD (or B-H15-WD) and D-H12-WD (or D-H15-WD).

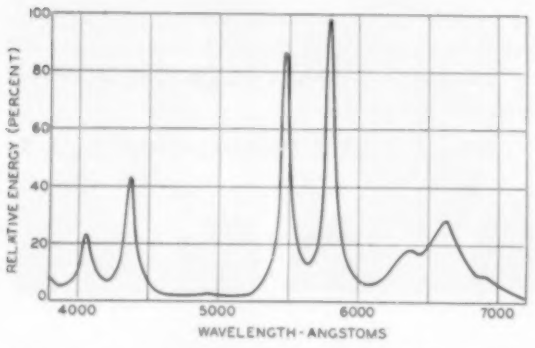

Figure 2. Spectral distribution for a typical fluorescent-mercury lamp (J-H1-WD).

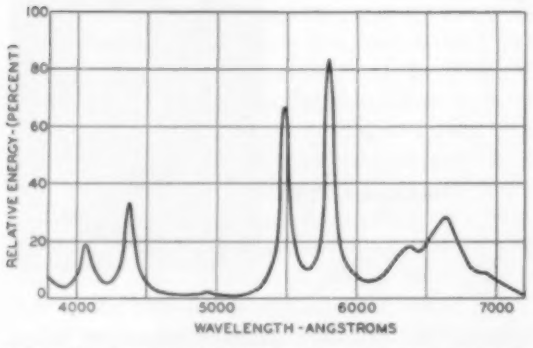

Figure 3. Spectral distribution for a typical 400-watt BT37 bulb de luxe fluorescent-mercury lamp. (Output from 6000-7200 0A equated to that of Fig. 2 to afford comparison of relative output at other wavelengths. (Note reduction in green and yellow lines.)

The new de luxe lamps are interchangeable with regular fluorescent-mercury lamps, except that lumen output is 20 to 25 per cent less. Fig. 1 shows several of the new types which have been created and their standard counterparts. The only visible difference is that the de luxe bulbs have a light purplish instead of a white appearance. This derives from a durable colloidal metallic coating (luster) which is fired onto the glass prior to other manufacturing operations. Magnesium fluorogermanate phosphor is used in both types of lamps.

A light purple color was chosen for the luster because it transmits relatively high percentages of blue and red and less green light. The visible spectra of mercury and fluorescent-mercury lamps are dominated by the green line at 5461A, which lies very close to the peak of eye sensitivity, and the yellow line at 5770-90A. Figs. 2 and 3 show the relative spectral energy distribution of a typical fluorescent-mercury lamp and its de luxe equivalent, with the red section above 6000A arbitrarily equated to emphasize differences in the yellow and green. The thickness of coloration applied to the bulb is held to tolerances that permit the finished de luxe lamps to transmit 75 to 80 per cent as much light as the corresponding standard types, as it was felt that this was a proper balance between economy and aesthetics.

De luxe fluorescent-mercury lamps are being tried out in the relighting of high-ceilinged offices and will be of interest in other similar areas. They will probably find application in libraries, churches, museums, banks, transportation terminals, stores, store-windows, gymnasiums, auditoriums, lobbies or hallways, schools, etc. Some interest has also been expressed in their use in street and flood lighting, but this is not expected to become a large factor.

In addition to their use in the conventional type of luminaires, it is anticipated that de luxe fluorescent-mercury lamps, especially of the semi-reflector type, will be used in some indirect lighting fixtures as well as in downlights. The new de luxe lamps will permit the preservation of architectural beauty in ceilings that would be unsightly if cluttered up with a tremendous number of fixtures as would be required in the case of either incandescent or fluorescent lamps.

De luxe fluorescent-mercury lamps of several types and sizes will be available soon for study and trial. They should open up new markets for mercury-type lamps in commercial and specialized applications.

(Abstract of I.E.S. Conference Paper No. 13.)

Abstracts of
I.E.S. Conference Papers on

Applications

Footcandles, Footlamberts—What Next?

George W. Clark

Richard E. Harz

For many years the growth of our design practice for general interior lighting could be measured simply in footcandles. It was not until about 1947 that consideration of brightness relationships became popular in lighting design. Today very high levels of illumination are receiving considerable attention, and the interest in the glare aspects of brightness is probably at a peak.

Important as they are, completely satisfactory lighting installations cannot be designed on the basis of footcandles and footlamberts alone. Among the at least eight factors[4] of lighting design there are two which have received too little emphasis. These are the *aesthetic effect* and the *psychological effect*.

Generally speaking, our special concern with footcandles and footlamberts has tended to make us content with lighting installations which are "acceptably good." The authors of this paper urge more attention be given towards making our lighting installations "positively pleasant."

Three outstanding papers have been given in recent years at the I.E.S. National Technical Conferences which emphasize this position. They are those of Weston[1] in 1953, Kalff[2] in 1954 and Pawley[3] in 1955.

Relatively speaking, the psychological effect has received very little attention in general lighting practice. Color with its psychological attributes of being "warm" or "cool," "advancing" or "receding" has been used to some extent. Brightness patterns have sometimes been employed to influence traffic flow in stores. Beyond this there has been little thought given to the psychological effect in lighting designs for offices, drafting rooms, classrooms, semi-industrial areas and similar locations which are the subject of this paper.

There is another psychological effect which is applicable to lighting and that is the effect of change. Heretofore, this has been considered impractical even by those who recognize its merit. The authors contend that it is now both practical and economically feasible to design change into the lighting of such areas as offices in order to realize its psychological benefits.

These changes take the form of variation in:

(1) spectral quality of illumination,
(2) appearance of the lighting system,
(3) levels of illumination.

Items 1 and 3 can be accomplished with today's low-cost dimming equipment and variety of lamp colors. Item 2 can be achieved in a variety of ways, but probably the lighting system which lends itself most readily to this treatment is the translighted ceiling.

Changes in lighting can be accomplished in frequency ranging from years to minutes. A lighting installation has been designed in which changes in

AUTHORS: Sylvania Electric Products Inc, Wheeling, West Va.

terms of days and minutes has proven practical (Fig. 1). Furthermore, this change appears to produce a beneficial stimulation of the occupants by providing relief from the monotony of the essentially static lighting which is typical of today's practice. These changes include those of appearance, accomplished by rearrangement of colored panels and baffles in an extended area lighting system, and those of illumination levels and spectral quality by the use of dimming equipment for fluorescent lamps. Also included to make continuous changes was a device to rotate 300-watt R40 colored floodlights (Fig. 2). These produced an ever-changing pattern on the plastic of the ceiling.

Figure 1. Installation designed for changes in terms of days and minutes.

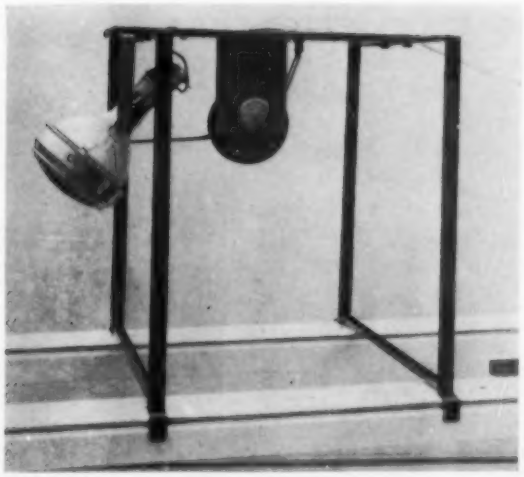

Figure 2. Device included to make continuous changes rotates 300-watt R40 colored floodlights, producing an ever-changing pattern on the plastic of the ceiling.

A review of the costs of such systems compared with viewing present-day lighting systems in common use indicates that they are no longer impractical, due to recent development in equipment and to the economic "climate" which the lighting industry has achieved for its product.

Before our preoccupation with footcandles and footlamberts unduly influences our standards of lighting practice, we should give greater emphasis to the aesthetic and psychological aspects of lighting both in practice and scientific investigation.

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(Abstract of I.E.S. Conference Paper No. 5.)

Experience with High Level Office Lighting

J. M. Ketch

W. S. Fisher

THERE is a wide gap between the levels of illumination which laboratory tests indicate as desirable for office tasks and those which are currently being installed. It is obvious that installation and operating costs influence the choice of footcandle levels of illumination. Yet we take advantage of the higher levels of natural daylight whenever possible at windows, under skylights and in the shade of a porch.

Aside from economics, however, there are equally important questions as to whether we know how to design high levels that are visually comfortable, whether we have suitable luminaires and application techniques to produce them, and whether the brightnesses and brightness relationships recommended for 50-100 footcandle installations apply also to those in the 100-500 footcandle range.

Believing that the answers to many of these questions can be found only by living and working full time under full scale office installations with high levels of illumination the authors, and an associate, Carl Allen, have enjoyed a year or more under two types of high level installations. Their experiences and recommendations for other such tests or installations are reported here for the benefit of others.

In one office the technique used was a large centrally located free-floating panel using an expanded hexagonal cell aluminum louver. The aim was for

AUTHORS: General Electric Co., Nela Park, Cleveland, Ohio.

Figure 1. This "Floating Panel Luminaire" was installed without the need for fitting to the room's perimeter. Illumination on the table top is well over 200 footcandles.

a level of about 200 footcandles.

In the other office the technique employed was a "trofferall" system consisting of 12-inch wide two-lamp etched aluminum troffers with parabolic reflectors installed side-by-side. More than 400 footcandles are provided on the desk surfaces. Forty-watt rapid start lamps are used operated on electronic dimmers which permit observation of visual tasks under various levels of illumination.

It appears that, in general, the present I.E.S. reflectance recommendations for room and work surfaces which are based on comparatively low 50- to 100-footcandle installations are also satisfactory at several hundred footcandles. This appears to be further borne out by the expressed preference of visitors. Almost universally the "Floating Panel Luminaire" is regarded as acceptable in visual comfort and appearance. In the "Trofferall" installation a great many visitors select 200 to 300 footcandles as a level they would "like to have." It is hoped that this report on high level lighting installations will encourage others to make their own installations. The experience to be gained will be helpful in planning for the high level systems of the future which progress is sure to make practicable.

(Abstract of I.E.S. Conference Paper No. 4.)

Figure 2. In this office the illumination on the desks is 450 footcandles. All the components of the environment were carefully chosen before the lighting was installed.

Acoustics and Lighting

George W. Clark

THE GROWING importance of extended area lighting systems and the trend toward higher illumination levels at lower ceiling heights using recessed or surface-mounted luminaires has made it necessary for the illuminating engineer to have a good understanding of acoustics in order to better promote good lighting. While our natural inclination may be to dismiss all acoustical design considerations as problems for the architect, consulting engineer, or acoustical engineer we cannot so readily divorce ourselves from the problem without losing much of the initiative in designing the lighting as well.

AUTHOR: Sylvania Electric Products Inc., Wheeling, West Va.

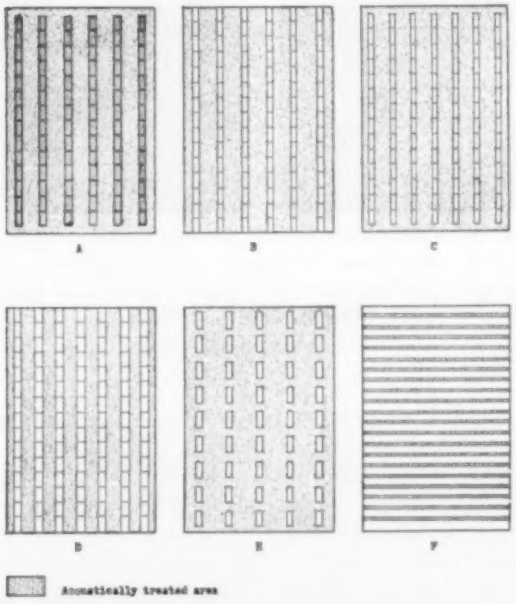


Figure 1. Six typical office lighting and acoustical systems. Assumed conditions: 40 ft x 60 ft office, 10 ft from floor to finished ceiling. Ceiling reflectance 75, wall reflectance 50. Plaster walls, glass window (area 5 ft x 50 ft), concrete structural ceiling, and linoleum tile on concrete floor. Illumination levels approximately 75 footcandles.

A. 2-lamp louvered suspended luminaire — acoustical plaster ceiling.
B. 2-lamp troffer with glass lens — perforated metal pan ceiling.
C. 2-lamp troffer with diffuse glass — acoustical plaster ceiling.
D. 2-lamp, wide, surface mounted luminaire with diffuse glass — perforated metal pan ceiling.
E. 4-lamp, wide, troffer with glass lens — vegetable fiber acoustical tile ceiling.
F. Vinyl plastic with rows of acoustical baffles 3 ft cc.

It is competition for the most obvious and readily available surface for acoustical treatment — the ceiling — that creates the problem. The solution is, understandably, in compromise. To properly effect this compromise the illuminating engineer should understand several aspects of acoustics, particularly for rooms such as offices and classrooms where both good lighting and proper acoustics are considered essential.

The *noise reduction coefficient* is today the most commonly used criterion of acoustical materials. Coupled with this is a concept of *noise reduction* whose dimension is decibels. Unfortunately, neither of these terms involves psychophysical concepts.

There is an acoustical term which has a psychophysical meaning. It is *loudness*. The involved calculations necessary to obtain the *loudness reduction* resulting from a particular acoustical treatment probably explain its infrequent use by architects.

A "typical office" is assumed and six "typical" lighting and acoustical systems are suggested. These include suspended luminaire (System A), recessed troffers (Systems B, C, D and E) and a luminous ceiling. Coupled with these are a variety of popular acoustical ceilings. Each system is then compared on the basis of *noise reduction coefficient*,

TABLE I — Acoustical Characteristics of the Six Lighting and Acoustical Systems Shown in Fig. 2.

Lighting and Acoustical System	Noise Reduction Coefficient	Noise Reduction (decibels)	Absorption Units	Loudness Reduction %
A	.50	7.7	1200	49
B	.85	9.2	1730	56
C	.50	6.9	1000	45
D	.85	8.2	1330	45
E	.70	8.4	1430	45
F	.40	6.8	960	42

noise reduction, *absorption units*, and *loudness reduction*. The results are shown in Table I.

It is obvious that the NRC is not a realistic criterion for determining the value of an acoustical system. Based on the *loudness reduction* achieved and accepted acoustical practice for office space, it appears that higher levels of illumination with the necessary increase in luminaires has not as yet seriously jeopardized the acoustics. Furthermore, properly designed, luminous ceilings can provide acoustical results comparable to those provided by many of the other commonly used lighting and acoustical systems.

(Abstract of I.E.S. Conference Paper No. 1.)

Left to right:
G. R. Baumgartner
R. T. Dorsey
E. A. Linsday

Application of Non-Circular Cross-Section Fluorescent Lamps

Figure 1. This modern industrial plant utilizes the new power groove system for general lighting throughout the manufacturing areas. Mounting heights range from 18 to 41 feet with lighting levels of 60-70 footcandles. The fixtures are aluminum with upward light and 35-degree cross shielding. The high output and efficiency of these lamps make lighting costs comparable with mercury and filament systems and the lower brightness makes the area more comfortable.

FLUORESCENT lamps of high light output per foot at comparable efficiency, life and maintenance to previously available sources have long been needed to improve lighting effectiveness in many fields. The introduction of a new type of lamp with non-circular cross section and having these characteristics was made over a year ago. It has already been applied in most of the major lighting fields, involving installations of several thousand lamps.

The non-circular cross section design shows unique characteristics of temperature sensitivity, burning position, and candlepower distribution. This has led to new photometric concepts, and methods have been developed to determine light output, light distribution of lamps and fixtures, without the use of large spherical photometers. It was found that the lamp must be operated both bare during rating and during photometric tests in the fixture in the actual position in service.

AUTHORS: Application Engineering, General Electric Large Lamp Department, Cleveland, Ohio.

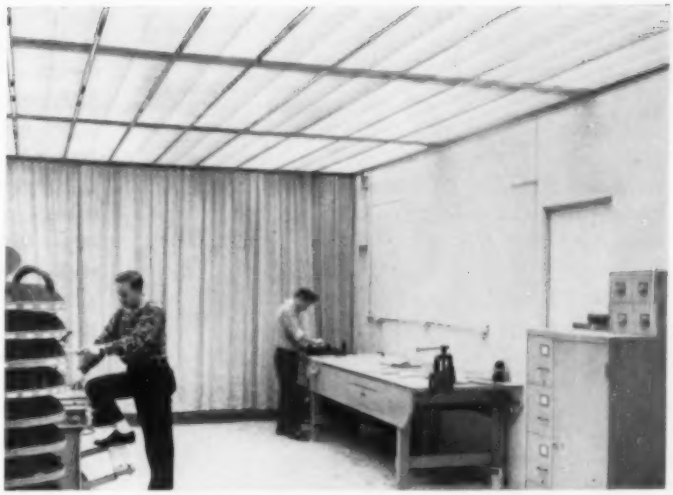


Figure 2. The high light output of the power groove lamp makes possible this 1000-footcandle demonstration area (14 x 24 feet) at Nela Park, Cleveland, Ohio. The lamps are mounted in 2-lamp aluminum fixtures 18 inches wide. Rows are on 19-inch centers making essentially a "trofferall" ceiling. Favorable visual comfort is achieved in the lengthwise direction by the use of "wedge" louver design with semi-polished aluminum finish.

The effect of light output and watts over a wide range of ambient temperatures was studied in a new large scale test facility. In addition to static surrounding air conditions, a wind tunnel was used (possibly for the first time in the study of fluorescent fixtures) to evaluate effect of aerodynamic characteristics of luminaires.

Next, calculations are presented which indicate the advantages and limitations of the lamps as far as general lighting design is concerned. These show for example that at 100 footcandles, which is recommended practice for many fields today, it is entirely practical to provide satisfactory uniformity of illumination in low ceiling areas as well as high. At levels of illumination in the 200-500 footcandle range, which are needed in many fields, the lamp is of particular value because patterns of fixtures are simplified over conventional sources, fewer lamps need to be maintained, and installation is simplified.

Because of the need to dissipate the higher wattage of lamps and ballasts, conventional fixture designs are not generally applicable. Some methods are discussed for removing the heat by natural and forced air circulation methods. Another advantage of heat dissipation is the improved light output

Figure 3. Floodlighting at the beautiful new Albuquerque Civic Auditorium utilizes the new non-circular cross section fluorescent lamp. Four 6-foot lamps per luminaire generate 28,000 lumens at high efficiency and have a color which gives a pleasing appearance to building surfaces, landscaping and people. The high light output per foot of the lamps and good design helps minimize luminaire size — an advantage from both appearance and structural standpoints. Illumination levels are 15 footcandles directly below the units, 5 footcandles 40 feet out from the units, and 2 footcandles at the auditorium doors.

from the fluorescent lamp in most interior applications. This is even more important with this highly loaded lamp than with conventional designs.

Because of the unique lamp geometry the temperature differentials in the lamp are substantially higher than in a round lamp. The coolest part of the lamp determines the mercury vapor pressure. Special techniques for maintaining optimum pressure are discussed.

Optically the high light output per foot of the lamp is expected to result in new interest in controlling light distribution and brightness by means of reflectors of polished or semi-polished metal. Reflector contours are shown for general lighting and for special applications. A new louver design is shown which marks a major step forward in the design of brightness control for lengthwise viewing. This permits basically higher lighting levels and at lower mountings with equal or better visual comfort.

The application of the lamp for industry, stores, schools, offices and exterior lighting is discussed in terms of the particular needs and opportunities in each of these fields. It is expected that the noncircular cross section fluorescent lamps will make practical a major step forward in almost every lighting application.

(Abstract of I.E.S. Conference Paper No. 17.)

Fluorescent Strip Runway Lighting

Sandford C. Peek

RECTANGULAR areas with one dimension relatively greater than the other can be illuminated either by a multiplicity of concentrated luminaires as is now common in street lighting, or can utilize a linear light source with an appropriate reflector. This paper is concerned with the linear source system.

Although electronic landing aids have landed aircraft without any visual contact, the need for visual guidance in both the approach and touchdown stages of a landing has been well established by the CAA, the airlines and the military. The most commonly used runway lights which line either side of the runway serve only as beacons and the resultant "black hole" is becoming increasingly dangerous as the "jet age" approaches. One approach to this problem is to fill the "black hole" with additional beacon type lamps. Naturally, such lamps must have a translucent covering and be imbedded in the runway surface. While this system narrows the "black hole" and may provide more precise height guidance, it becomes necessary for the pilot to estimate the location of the runway when this concept is employed. If the runway could be illuminated, no mental gymnastics would be required. The recent developments in very high output (VHO) fluorescent lamps provided a means of adequately floodlighting a runway from the low elevations required by propeller clearance. It was essential that the floodlighting fixture must:

(1) provide adequate runway illumination,

(2) be frangible so that an aircraft would not be damaged in the event that it left the runway,

(3) have little upward light that would contribute to glare.

A high brightness fluorescent lamp is a light aluminum fixture employing a reflector large compared to the lamp diameter and of accurate contour satisfies the above requirements.

A Practical Luminaire

High brightness fluorescent lamps of relatively small diameters are now available. The VHO 25 reflector lamp has a surface brightness of 4700 footlamberts, produces 10,000 lumens and draws 200 watts from the line. If such lamps were run along either side of the runway in continuous strips, 250,000 lumens would be available per 100 feet of runway. It is essential that these lumens be spread out over the runway surface and not up into the pilot's eyes. The luminaire described in this paper

AUTHOR: Sylvania Electric Products Inc., Salem, Mass.

accomplishes this by employing a reflector large compared to the lamp diameter, and of accurately controlled contour.

One hundred seventy-two fixtures were installed at Andrews Field in Maryland by the CAA for flight evaluation. The photograph shows a picture of the runway at Andrews Field, and clearly illustrates the good height guidance that could be obtained from an illuminated runway. The white strip down the center is actually tar expansion joints painted white. The flight tests at Andrews Field were very successful and safe landings were made in conditions of $\frac{3}{16}$-mile visibility and 50 feet. Thus, the development of very high output fluorescent lamps of relatively small diameters, has made possible luminaire designs capable of controlled illumination. These make use of grazing light with relatively little glare practical for lighting long, narrow areas.

(Abstract of I.E.S. Conference Paper No. 21.)

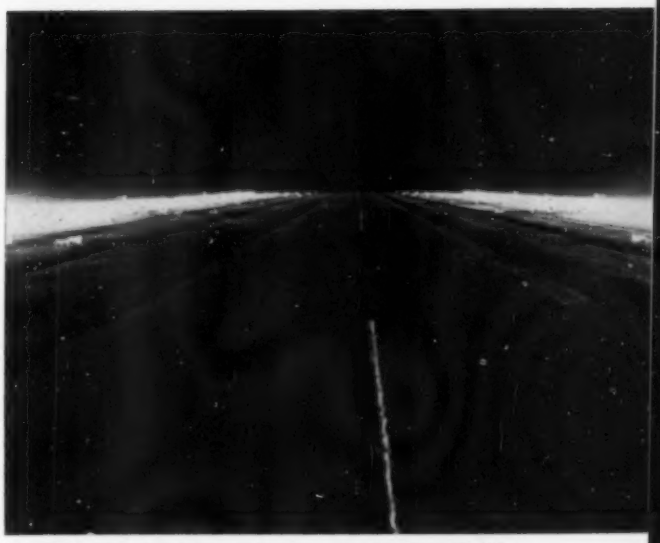


Figure 1. Photo of actual runway, at Andrews Field in Maryland, as viewed from the approaching aircraft.

Uses of New Mercury Lamps

D. R. Phillips

E. C. Martt

THE INCREASING number of new mercury lamps for general lighting purposes has resulted in a need for more information on these lamps and their equipment to help guide their use. This paper supplies information on some of the new mercury lamps so that in each application the lighting system can give maximum benefit to the user.

New Linear Quartz Light Source

There has been a need for some time for a more compact lamp than the H3000-A9, and a new high output, quartz linear light source has been designed to fill this need. This is the H1500-A23, a 1500-watt, tubular, jacketless, quartz mercury lamp (Fig. 1) with a 12-inch lighted length. Table I provides data on this new lamp and compares it with the older 3000-watt tubular lamp (H3000-A9). The new lamp has 23 per cent higher efficiency and

AUTHORS: Large Lamp Department, General Electric Co., Nela Park, Cleveland, Ohio.

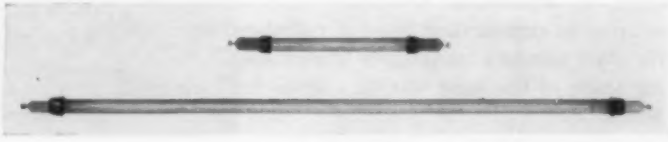


Figure 1. The new all quartz 1500-watt mercury lamp (top) compared to the heat-resistant glass 3000-watt mercury lamp (bottom).

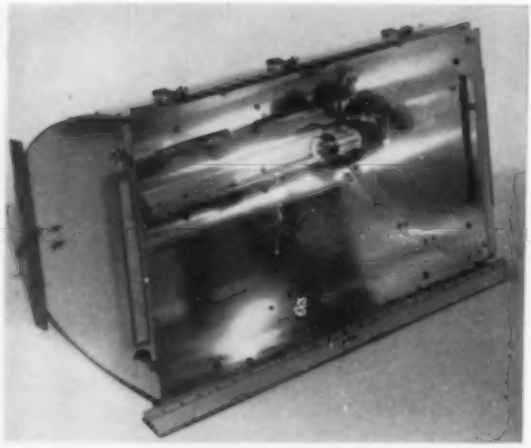


Figure 2. One of the experimental industrial reflectors designed for the 1500-watt lamp. This unit has a glass bottom and a ventilation method which eliminates direct ultraviolet radiation from the luminaire.

almost double the watts per inch of the 3000-watt lamp.

During operation, a tubular, jacketless quartz lamp must always be operated in a suitable enclosure. This enclosure shields the lamp from winds and drafts, and a glass cover is necessary to protect the human eye from the short wave ultraviolet radiation transmitted by the quartz. In a highly-loaded jacketless lamp which has seals exposed to air, seal temperature must be less than 650 F in order to prevent seal oxidation. A special lamp end construction was designed to meet these temperature conditions. This design combines a ventilated base insulator, lead wires of high thermal conductivity to remove heat from the seal, and placement of the lamp electrodes as far out of the base as possible in order to reduce the arc wattage dissipated in the base.

Applications of H1500-A23

To investigate luminaire designs for various applications, several experimental units were made, three for industrial lighting and one for floodlighting.

One of the glass-bottom industrial reflectors (Fig. 2) was ventilated to reduce the lamp seal temperatures. The ventilation openings were designed to eliminate direct ultraviolet radiation from the luminaire. Luminaire efficiencies were equal to or greater than those of reflectors designed for other mercury lamp types. The crosswise shielding angle of the lamp was 45 degrees for each reflector.

TABLE I — Physical and Electrical Characteristics of H1500-A23 and H3000-A9 Mercury Lamps.

	H1500-A23	H3000-A9
Watts	1,500	3,000
Lumens (Approx. initial)	81,000	132,000
Lumens Per Watt	54	44
Mean Lumens (Approx.)	62,000[1]	103,000
Lumens Per Foot	81,000	33,000
Rated Life, Hours	6,000[1]	6,000
Bulb, Glass Type	T9 (Quartz)	T-9½ (Glass)
Base	S.C. Terminal	S.C. Terminal
Burning Position	Horizontal	Any
Maximum Over-all Length, Inches	19½	55
Loading, Watts Per Inch	125	63
Arc Length, Inches	12	48
Lamp Operating Volts	425	535
Minimum Open Circuit Voltage	750 (to −10° F)	850[3]
at Minimum Primary Voltage	900 (to −20° F)	
Lamp Starting Current, Amps.	6[2]	9.3
Lamp Operating Current, Amps.	3.9	6.1

[1]Estimated.
[2]7.0 Amps. Max.
[3]Nominal Open Circuit Voltage at Rated Primary Voltage.

The experimental floodlighting reflector was designed for building floodlighting applications where the units need to be mounted close to the building. In the plane perpendicular to the lamp axis, an average intensity of 140,000 candlepower was obtained over the central 3-degree cone. In the plane parallel to the lamp axis, the desired "bat-wing" distribution provided a maximum of 180,000 candlepower at about 30 degrees from nadir.

Other reflector designs would make this lamp useful for general floodlighting such as parking lots and outdoor work areas. In addition, the large amount of blacklight radiation from this lamp should make it useful in the fields of spectacular and electrical advertising and for inspection and supplementary lighting in industry.

Color-Improved Reflector Lamps

Although a tubular, high-output mercury lamp has advantages in some areas of industrial and exterior lighting, in others the color-improved reflector mercury lamps are often the more logical choice. The advantages of lighting systems employing these lamps are reduced maintenance, color-improved light, and good economics. There are 400-watt (H400-RC1 and H400-RW1) and 1000-watt (H1000-RC15 and H1000-RC12) color-improved reflector mercury lamps. Each of these lamps directs approximately one-third of its light downward (base-up operation). Thus, the amount of light controlled by the external reflector is less than that of conventional mercury lamps. This provides an opportunity to design more efficient reflectors and reflectors which have better maintenance characteristics.

(Abstract of I.E.S. Conference Paper No. 18.)

A Study of the Extraction of Heat from Fluorescent Luminaires in Air Conditioned Rooms

Walter Sturrock

Lester F. Schutrum

A TEST ROOM in the American Society of Heating and Air Conditioning Engineers' laboratory, Cleveland, Ohio was designed and installed for a series of investigations related to the performance of ceiling panel heating and cooling. One of the series, as reported in this paper, included a study of the dissipation of energy through ceiling panels from fluorescent luminaires.

Data were recorded from three sets of conditions as follows:

1. With the supply air at 60 F and ceiling panel temperatures of 65, 70 and 85 F observations were made with five air changes per hour.

2. With ceiling panel temperatures held constant at 70 F and supply air temperatures of 60, 70 and 75 F observations were made with five air changes per hour.

3. With the ceiling panel temperatures at 70 F and supply air at 60 F observations were made with ten room air changes per hour.

The results indicate that:

1. With five air changes per hour the radiant energy removed from direct fluorescent luminaires is about 42 per cent of the total energy generated by them. The corresponding value for indirect units is about 30 per cent. With ten air changes per hour these values are 34 and 25 respectively.

2. With five air changes per hour of 60 F supply air, ceiling panels at 70 F will absorb about 15.1

AUTHORS: General Electric Co., Nela Park, Cleveland, Ohio, and American Society of Heating and Air Conditioning Engineers, Cleveland, Ohio, respectively.

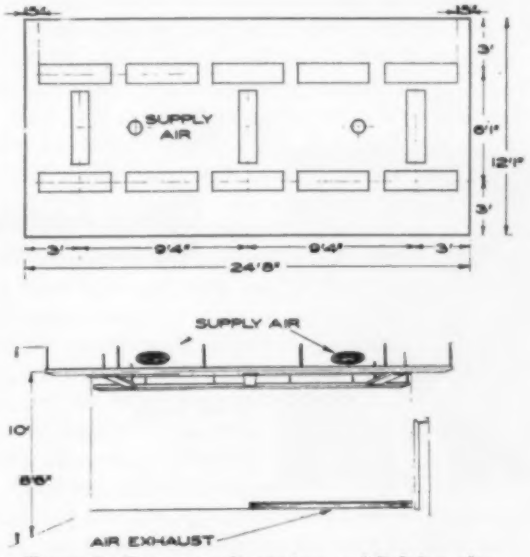


Figure 1. Test room dimensions and lighting plan.

Figure 2. View of the direct and indirect fluorescent installations. Circulating air enters room in center of ceiling.

per cent of the total BTU from direct fluorescent luminaires and about 18.5 per cent of the total energy from indirect luminaires. With ten air changes per hour these values become 12 and 16.5 per cent respectively.

In summarizing the test results the authors have commented as follows: Many fluorescent lighting systems employ luminaires of the open bottom or louvered direct type and the tests indicate that about 42 per cent of the watts consumed by such units will be converted into radiant energy with about 58 per cent in convected heat. When these direct types of luminaires are built into a ventilated ceiling with glass or plastic bottom plates or are installed above a ventilated false ceiling it seems evident that the low temperature radiation and convected heat transferred into the room will be considerably less than obtained from luminaires suspended below the ceiling. Moreover it seems logical to further conclude that fluorescent lighting systems of the so-called luminous ceiling design will have their energy most effectively dissipated if a cooling system either of circulating air or coils of cold water or a combination of them can be installed above the ceiling in a manner to remove heat before it enters the room.

(Abstract of I.E.S. Conference Paper No. 2.)

Optical Applications of Mercury Short-Arc Lamps

E. W. Beggs

THE GRADUAL development and perfection of short-arc mercury lamps has been reported to the Society during the last few years. Today the prediction of the past with respect to the potential usefulness of short-arc mercury lamps in general has been realized. They are being used in all of the applications anticipated and in addition, in others that were not considered likely to develop.

In illuminating engineering, the "point source" is needed chiefly for searchlights, for picture projection, and for optical instruments. Short-arc lamps develop an intensely bright, small, and almost spherical source which approaches the optically important "point source." In higher wattages, therefore, the short-arc mercury lamp is being introduced for use where the carbon arc was formerly required.

AUTHOR: Westinghouse Electric Corp., Bloomfield, N. J.

Application of short-arc mercury or short-arc mercury-xenon lamps to searchlights has involved the conversion of existing incandescent or carbon arc units. The U. S. Navy has rebuilt more than 500 12-inch searchlights. By substituting a 1000-watt short-arc mercury-xenon lamp for the 1000-watt incandescent tungsten filament lamp formerly used, the maximum beam candlepower was increased from 100,000 to 3,000,000. A diagram of typical searchlight optics is shown in Fig. 1. In civilian searchlight applications, river-boats require searchlights similar to Navy lights, but of a higher power. The 2500-watt short-arc mercury-xenon lamp will find great usage here. In addition, advertising beacons and landmarks will use these lamps in increasing quantities to attract attention for commercial purposes and/or airway navigation.

In instruments where lenses, reflectors, prisms, mirrors, and other optical elements are used, closely controlled light beams are required. The high brightness and "point source" features of short-arc lamps provide the instrument designer with a new lamp to improve instrument performance. Short-arc lamps in an optical comparator can provide light rays through the optical system which are

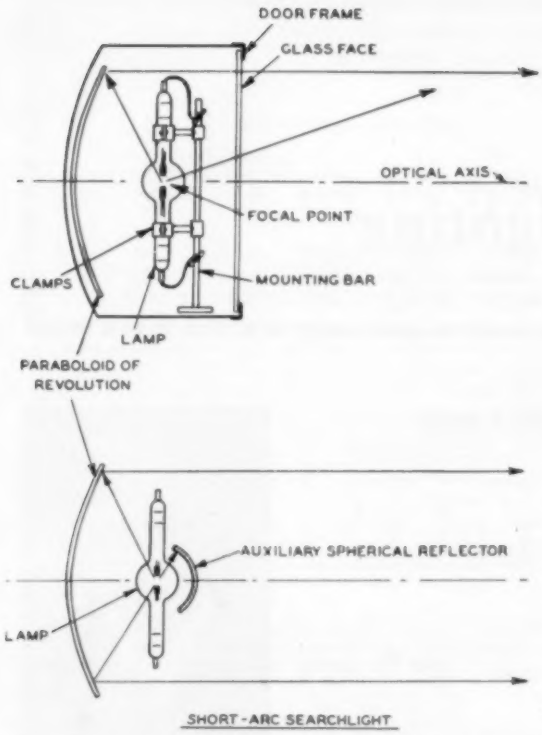


Figure 1. Sort-arc lamps are now used in searchlights with axis of arc at right angles to plane of reflector. Auxiliary spherical reflector increases beam candlepower but shortens useful lamp life somewhat.

extremely parallel. This provides a clear, sharp image on the screen. The high intensity is useful in surface inspection also.

In polarizing instruments, collimated light rays are essential. The small, brilliant source of the short-arc mercury lamp is very desirable in providing this feature. Polariscopes are commonly used to test the characteristics of birefringent liquids. The short-arc lamp with its high brightness will extend the usefulness of existing polariscopes since it will provide accurate measurement through liquids which today cannot be measured.

Where a picture is to be projected on a screen or other surface, the short-arc lamp is useful as long as the blue-green-white color of the mercury spectrum can be utilized. Short-arc lamps have found application in black and white television back screen projection, microfilm "reading," and other projection uses. An interesting case of image projection is that involved in the SAGE intercontinental air defense system. This operation involves radar receiving stations located at various strategic points throughout the world. Information is fed to a central headquarters in the United States. Images received on any particular radar screen can be photographed on motion picture film and that film projected on a large screen for study by many persons. To provide the high brightness required to produce a clear picture on the screen, as well as long lamp life, the 1000-watt short-arc mercury-xenon lamp was selected. This lamp in combination with a highly efficient optical system produces a ten-foot square image of approximately the same color and brightness of the radar screen itself.

In photocopy printing work, a short-arc lamp can be used to advantage. An image of a microfilm record is projected on photographic paper, diazo paper, or an electrically charged selenium drum. When an electrically charged drum is used, carbon granules are electrostatically deposited on paper and then permanently bonded. High brightness and "point source" are very desirable for clear, fast printing. Also diazo paper is most sensitive in the near ultraviolet range and the 3650A line of the mercury spectrum is therefore important.

Short-arc mercury or mercury-xenon lamps are new in photochemistry. The fact that rays from the short-arc lamp can be accurately directed is important in some photochemical applications. Printing clear sharp designs in photosensitive glass is one such example. Another is the manufacture of color television tube end plates. Tiny spots of phosphor must be very accurately deposited at precise points on the end plate. The short-arc lamp rays are directed through a screen with thousands of minute holes onto photosensitive glass. The "point source" advantage of short-arc lamps provides extremely accurate "spotting."

Short-arc mercury and mercury-xenon lamps are invading the field of optics today, chiefly because they are high brightness "point sources" of light that operate simply and consistently like an incandescent lamp. First developed for military purposes they now promise to solve optical problems that never could be solved before. These range from that of increased accuracy of a laboratory instrument in a hospital to the addition of five miles range on a navigation searchlight on the Suez Canal.

(Abstract of I.E.S. Conference Paper No. 19.)

See list of Sustaining Members beginning on page 29A.

Abstracts of
I.E.S. Conference Papers on

Street Lighting

Application Experience with Mercury Vapor Lamps In Street Lighting Service

John W. Young

THE ACCELERATING use of mercury vapor lamps in street lighting service has come about through the demonstration of the economies inherent in this highly efficient type of light source, and operating advantages and features, as color, that are peculiar to the electric discharge lamp.

This paper directs attention to some of the developments in the present family of lamp sizes and types; a luminaire operating cost comparison as between all-mercury and standard incandescent sources; certain operating points of lamp starting and operation on reactors or chokes; experience with light distributions on narrow roadways and lighting arrangements for various classes of streets.

TABLE I — Lamp Designations and Initial Lumen Output.
Lamps Recommended for Street Lighting Service.

Lamp Watts	Lamp Designation	Initial Lumens Vertical Burning Position
	Clear Mercury	
100	H100 — L4 or LH4	3,500
175	H175 — A22 or AH22	7,000
250	H250 — A5 or AH5 H250 — C5 or CH5	11,000
400	H400 — A1 or AH1 or AH1 — WD	15,500
400	H400 — E1 or EH1	21,000
700	*H1000 — A15	36,500
	AH18	36,000
1,000	H1000 — A15	55,000
	Fluorescent Mercury Color Improved	
100	H1000 — M4 or MH4	3,000
	BH22	6,000
250	DH5 CCH5	9,800 - 10,000
250	H250 — JH5	10,500
400	H400 — JH1	20,000
700	*H1000 — C15 34,500	
700	BH15	34,000
1,000	H1000 — C15 51,500	
1,000	BH15	52,000
	Color Modified	
100	SH4 or MH4 — SW	4,000
175	SH4 ———	7,700
400	SH1 or JH1 — SW	23,000
700	SH18 ———	40,000
1,000	SH15 ———	60,000

*Operating on a ballast furnishing 700 watts to the lamp.

While the 400-watt lamp accounted for most of the public way lighting to date, interest has extended to the larger wattage rating as the 700-watt lamp, and also the smaller, practical lamps as the 250-, 175-, and 100-watt sizes. These lamps and their various modifications, and lamp designations, are given in Table I.

A significant lamp development is the fluorescent-mercury lamp which improves the entire spectrum and provides higher output and lamp efficiencies that exceed the clear mercury types. In a sense it is a high efficiency lamp. The lamp offers a light source of whiter appearance that enhances the attractiveness of mercury illumination in many instances.

Reference is made to the three essential lamp performance characteristics, efficiency, life and lumen maintenance, with specific comment on experience with the E-H1 lamp as to burning hours in service and data on lumen maintenance. The several years acquaintance with this lamp has served

AUTHOR: New England Power Service Co., Boston, Mass.

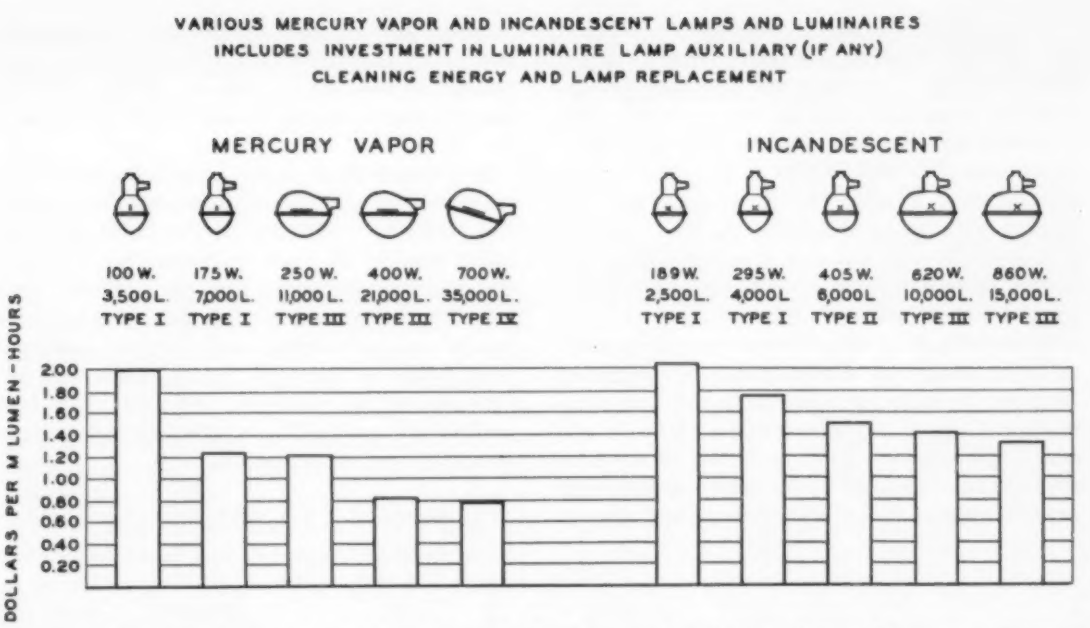


Figure 1. Street light luminaire study. Cost of light production; carrying charges taken at 15 per cent. Lamps at 30 per cent from List Price. For the purpose of this example, electricity taken at the lowest conceivable rate of 1½ cents per kw-hr.

among other ways as a guide in evaluating performance of other lamp ratings in an all-mercury source system.

An investigation of lamp starting voltage requirements for cold weather temperature conditions, such as prevail in southern New England, demonstrated that starting conditions are not as severe as formerly held. The results indicate that lower starting voltages than now generally provided in ballast designs are satisfactory for reliable starting of lamps. In this investigation, laboratory tests and field service trials were carried out on a

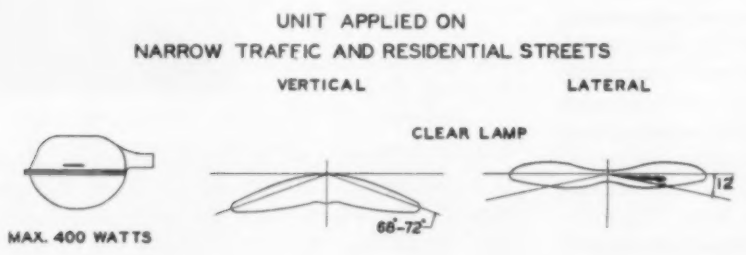
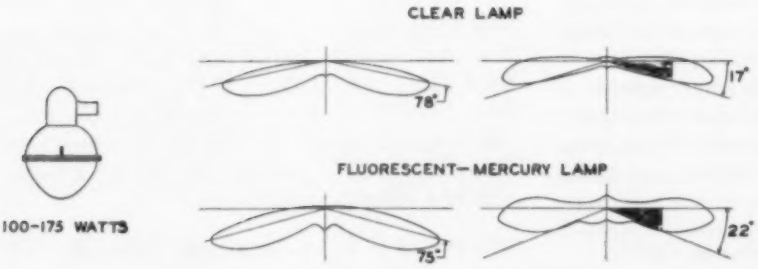


Figure 2. Mercury lamp luminaire light distribution characteristics.



new departure, the use of reactors or "chokes" operated directly from distribution mains at 240 volts, which is, of course, the maximum voltage available for starting. During the past winter, 175- and 100-watt lamps started consistently at the lowest temperatures experienced at street lamp turn on time, or at 0° and 2° F. Experiments are continuing on applying chokes for the 250- and 400-watt sizes. The savings in size, weight, losses and cost of manufacture of a choke over the conventional ballast appear to be substantial.

The results of a luminaire operating cost study, multiple primary in this example, comparing mercury and incandescent lamp units, has been summarized (Fig. 1). It demonstrates the wide economic advantages in light production of the mercury group, especially in the larger sizes though smaller wattage lamps are practical and may be justified under certain conditions. The economic position of mercury lamps is further advantaged through refinements in luminaire designs recently made available, higher utilization ratios for example.

A review is given of the principal specifications for all-mercury lighting arrangements for commercial, traffic and residential streets, based on installation practice of some years standing. Fluorescent-mercury installations of the 400-watt lamp have been made in commercial areas, with favorable results both as to light distribution and quality of illumination as shown in Fig. 2. Light distributions for narrow roadways, 26-28 feet, have been applied with satisfactory results as to light pattern and adaptation of equipment.

(Abstract of I.E.S. Conference Paper No. 28.)

Estimating the Cost Of a Roadway Lighting System

T. Summers, Jr.

IN PLANNING a roadway lighting system, many factors must be considered. One important factor is the type of circuit to be used. This might be either a constant current (series) system or a constant potential (multiple) system each of which has distinct advantages and disadvantages. Either of these systems might be an overhead or an underground installation. In the case of a divided roadway, the poles may be located in the medial strip or along the edge of the roadway. Other important factors are the type of pole and the type of light source to be used.

The choice of equipment is always influenced by the cost, and comparisons are made as to the relative costs for various luminaire-lamp combinations when served by different types of distribution circuits. These cost comparisons show in detail the factors that must be taken into account to obtain a true analysis of the systems considered.

For the conditions used in this study, there is no appreciable difference in annual cost between the use of a series or a multiple system for supplying electrical energy to a given luminaire-lamp combination.

By using wood poles and overhead wiring, there is a considerable reduction in the initial cost per unit. However, when all of the amortizing, operating, and maintenance costs are taken into consideration, the annual cost is only 20-30 per cent less than in the case of steel poles and underground wiring.

In the case of a divided roadway, the initial cost is approximately 20-25 per cent less to mount twin-bracket poles in the medial strip than to mount the units along the shoulders of the roadway. However, when all the costs are considered, the annual cost is approximately the same for an incandescent system and only 15 per cent cheaper for a fluorescent or a mercury installation.

(Abstract of I.E.S. Conference Paper No. 29.)

AUTHOR: Westinghouse Electric Corp., Cleveland, Ohio.

Analysis of Light Distributions from Linear Source Street Luminaires

By Robert G. McPhail

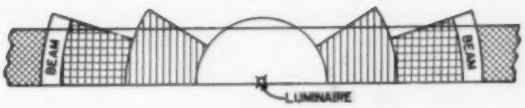


Figure 1. Plan view of street showing the distribution from a round luminaire.

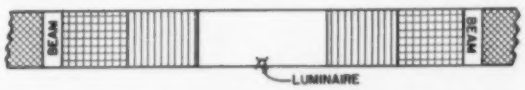


Figure 2. Plan view of street showing a rectangular distribution.

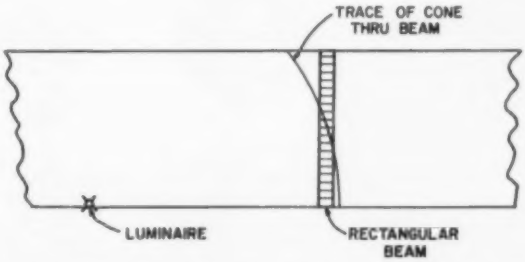


Figure 3. Arc of circle represents cone as it would cut diagonally through a rectangular beam.

THIS PAPER traces the historic development of street luminaires and the methods by which their performance is specified. It points out that round street luminaires can well be evaluated by a polar coordinate system of vertical planes and cones in which the light distribution from the luminaire is specified. A conventional diagram of the distribution of light from a round asymmetric street luminaire is shown in Fig. 1. It is made up entirely of radial lines and arcs of circles aimed to fit as well as possible the rectangular geometry of the street to be lighted.

About ten years ago street luminaires of oval shape with horizontally mounted mercury lamps were introduced. The paper points out that the light distribution from such a luminaire should no longer be analyzed by the presently accepted polar coordinate system of cones and vertical planes of maximum candlepower. Instead, as luminaires with horizontally mounted lamps produce rectangular distributions and project rectangular light patterns on the roadway, as shown in diagram of Fig. 2, it is desirable to devise a rectangular coordinate system. The data thus derived give a more accurate description of the light distribution from linear source luminaires.

The mathematical basis for such a rectangular coordinate system is described in detail, giving the derivations of salient formulae and equations.

The author points out that the present American Standard Practice for Street and Highway Lighting was written before linear sources were in general use. As it was written in terms of polar coordinates suitable for point sources in round luminaires, it is often misleading in describing rectangular distributions from luminaires using horizontally mounted mercury or fluorescent lamps.

Fig. 3 shows, for example, that if the rectangular beam actually developed by the luminaire is tested in a 75° cone, the data would indicate a much narrower beam than actually exists, the 75° cone cutting through the rectangular beam near its center. If a lower cone were tested, it would cut through the beam near the curb line, while a higher cone would cut through farther across the street. There could be any number of points in the rectangular beam pattern chosen for polar test cones. For each point there would be different vertical and lateral angles of maximum candlepower, which would form the basis of determining I.E.S. distribution types in terms of the present American Standard Practice for Street and Highway Lighting.

The author suggests to overcome this difficulty by adding to the present Recommended Practice a section for units with rectangular distribution written in terms of rectangular coordinate systems instead of the presently used polar system. Another possibility would be to retain the present Types I, II, etc., of the classifications, but base them on actual street geometry rather than angular width of luminaire distribution. Such values could logically be based on street width to mounting height ratios.

The paper analyzes in detail the problems arising from such proposed changes in the present Recommended Practice and makes some further suggestions for modifications, which the author believes might be desirable.

(Abstract of I.E.S. Conference Paper No. 26.)

AUTHOR: The Holophane Co., Inc., Newark, Ohio. Abstract prepared posthumously by Kurt Franck.

Abe H. Feder

Outdoor Lighting Design for the New York International Airport

THE OUTDOOR floodlighting of the 160-acre inner plaza of the New York International Airport's Terminal City required something more than current floodlighting practices could provide. A lighting design was sought which would achieve the following objectives: (1) Both a daytime and nighttime appearance aesthetically blended with the total architectural design; (2) An even blanket of light covering approximately 6,900,000 square feet; (3) A minimum of glare for control tower staff, pilots, motorists and pedestrians; (4) A maximum utilization of power in terms of lumen output; (5) A flexible beam pattern for targetting purposes; (6) A minimum of annual maintenance; (7) A lighting design which would not be out-dated in the foreseeable future.

The floodlighting design had to start with the objectives rather than the means. The first point resolved was the mounting height. It was decided to build towers 75 feet high which would be placed 325 feet on centers. This eliminated the necessity for a large number of poles; permitted luminaires to provide a uniform blanket of light; and minimized glare. The next point resolved was an overall pattern of beams which would cover the entire area; this determined the general beam spread of the luminaire being sought.

The light source developed specifically to meet these needs is the mercury vapor H1500A23 lamp. Technical data is as follows: T-9 quartz; 81,000 lumens; 1500W; 425 open circuit volts; 3.9 operating amp.; 6,000 hours life at 5 hours per start. The mercury vapor luminaire developed for this lamp has a compound reflector curve producing the desired beam spread from an average 72-foot mounting height. Luminaire dimensions and weight are: 22¼-inch diameter; 32½-inch length; 59½ lbs. The ballast operates the lamp at a power factor of 95 per cent and is designed to provide starting down to −10F. Yoke-mounted, the luminaire pivots 180 degrees vertically and 360 degrees horizontally.

The steel tower is a duplex tripod with its 3 legs twisting 165 degrees between top and bottom and intersecting about halfway from the base. An access platform is set 8 feet below the top. A vault, containing ballasts and disconnect switches, is located at each tower base.

In the final lighting layout, 338 luminaires, individually targetted, supported on 43 towers, provide the desired blanket of light with illumination level of 3 to 8 footcandles over an area of approximately 6,900,000 square feet. By these means, the objectives of the original search were achieved.

(Abstract of I.E.S. Conference Paper No. 20.)

AUTHOR: Lighting Designer and Consultant, New York, N. Y

View of two towers at night (taken during first tests), at New York International Airport inner plaza.

Abstracts of
I.E.S. Conference Papers on

Daylighting

Control of Daylighting With Reflecting Jalousies

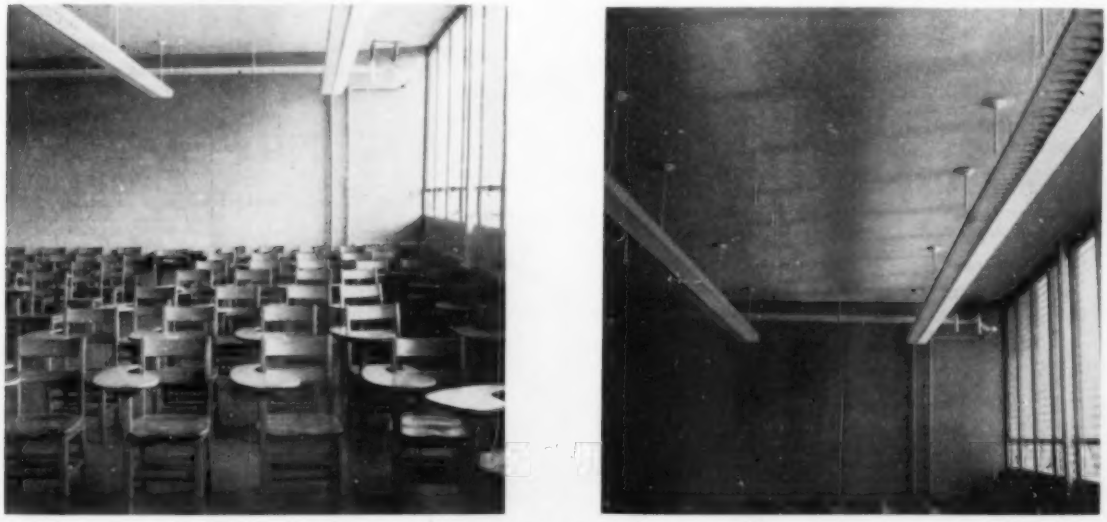
By T. C. Carson, Jr.

A STANDARD classroom with unilateral daylighting was tested for brightness contrast and daylight distribution when glazed with heat-absorbing glass, high-transmission obscure glass, and with high-transmission obscure glass and reflecting louver jalousies. The jalousies reduced the lighting level at the window wall, and increased the level along the opposite wall, by reflecting the above-horizon light onto the ceiling, from which it was reflected diffusely onto the work plane. An additional use for the installation was its service as a means of blackout for visual aid.

Exterior and interior pictures are shown, and a chart which indicates the redistribution features.

(Abstract of I.E.S. Cnference Paper No. 34.)

AUTHOR: Blue Ridge Glass Corp., Kingsport, Tenn.



Reflecting jalousies on classroom window walls reflect light to the ceiling: in photo at left, without direct sun on the window and, in photo at right, with direct sun on the window.

Daylight Illumination and Brightness With Minute Louvers

Walkley B. Ewing

R. L. Biesele, Jr.

Upon application, minute-louvered materials designed originally to minimize the heat gain at windows exposed to the sun have been found to have definite advantages as daylight control devices as well. Since, by design, the materials admit light directly to an interior only from that portion of the sky which is near the horizon, they prevent the entry of direct sunlight except at low sun angles in the early morning or late afternoon. The angle of the slats also admits light by reflection from the ground outside the windows.

The effect of the materials is, therefore, to reduce the quantitative variation in light admitted to the interior between conditions of sun on the window, and no sun. The materials also shield against the sky glare which is often associated with the upper portions of large window areas, and they improve the uniformity of the illumination and brightness pattern in the interior.

They are a fixed control, requiring no adjustment, yet allowing a free flow of natural ventilation, and the small visual size of the louver elements causes them to blend into the outward view. As with any material, however, the minute-louvered materials can be used with greater or lesser effectiveness. The paper discusses the salient characteristics of the materials, together with their application, as a guide to more effective use of these materials in daylight control.

(Abstract of I.E.S. Conference Paper No. 33.)

Authors: Ewing Development Co., Grand Rapids, Mich., and Fenwal Inc., Ashland, Mass., respectively.

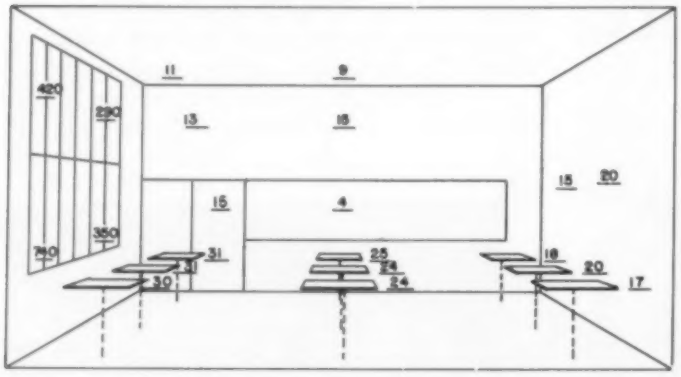


Figure 1. Test classroom at Hillcrest High School, Dallas, Texas, with minute-louvered material on clear glass windows, overcast sky, 1000 footcandles incident illumination on windows, of which 87 footcandles is from below the horizon. Values at desks are illumination in footcandles. All other values are brightness, in footlamberts.

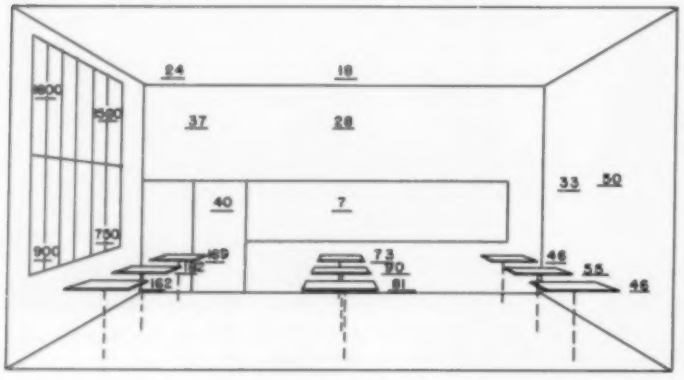
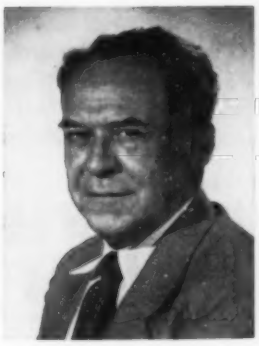


Figure 2. Identical comparison classroom, no controls on windows, to same base, same notation as in Fig. 1.



Left to right:
J. W. Griffith
W. J. Arner
O. F. Wenzler

Practical Daylighting Prediction

THIS PAPER presents a practical and simplified method for predicting the work plane distribution of daylight through clear glass fenestration. It is directly applicable to fenestrations with overcast or clear sky conditions with no sun incident on the fenestration. Where sun is incident on the fenestration, this prediction technique may be used if diffuse controls are employed. This is accomplished by using a combination of uniform sky and uniform ground prediction techniques.

The work plane distribution is predicted at various points along a center line perpendicular to the fenestration wall using the equation:

$$E_{wp} = E_i \times A_f \times C.U. \times K_c$$

AUTHORS: Griffith, Southern Methodist University, Dallas, Texas; Arner and Wenzler, Libbey-Owens-Ford Glass Co., Toledo Ohio.

where:

E_{wp} = The work plane illumination at a particular point.

E_i = The incident illumination on the fenestration from either the sky (E_{is}) or the ground (E_{ig}).

A_f = The light transmitting area of the fenestration.

$C.U.$ = The coefficient of utilization combining the effect of the length, width, and reflection factors of the room.

K_c = The factor of variation due to the combined effect of the ceiling height in conjunction with the width of the room and room reflectances.

The coefficients of utilization and the K_c factors

TABLE I — Coefficients of Utilization for Clear Sky with No Control on the Fenestration.

Wall Reflectance		20-ft Length		30-ft Length		40-ft Length	
	Width	70%	30%	70%	30%	70%	30%
MAX	20	.0185	.0156	.0129	.0111	.0099	.0088
	30	.0183	.0156	.0123	.0108	.0088	.0083
	40	.0180	.0151	.0118	.0107	.0086	.0082
MID	20	.0138	.0094	.0090	.0071	.0075	.0060
	30	.0074	.0049	.0056	.0039	.0041	.0033
	40	.0047	.0029	.0036	.0025	.0026	.0021
MIN	20	.0095	.0054	.0071	.0044	.0060	.0039
	30	.0049	.0025	.0042	.0021	.0029	.0019
	40	.0028	.0013	.0024	.0012	.0019	.0011

TABLE II — Ceiling-Width Variable (K_c) for Clear Sky with No Control on the Fenestration.

Ceiling Height		8 feet		10 feet		12 feet		14 feet	
Wall Reflectance	Width	70%	30%	70%	30%	70%	30%	70%	30%
MAX	20	.145	.155	.129	.132	.111	.111	.101	.0982
	30	.141	.149	.125	.130	.111	.111	.0954	.101
	40	.157	.157	.135	.134	.111	.111	.0964	.0991
MID	20	.110	.128	.116	.126	.111	.111	.103	.108
	30	.106	.125	.110	.129	.111	.111	.112	.120
	40	.117	.118	.122	.118	.111	.111	.123	.122
MIN	20	.105	.129	.112	.130	.111	.111	.111	.116
	30	.0994	.144	.107	.126	.111	.111	.107	.124
	40	.119	.116	.130	.118	.111	.111	.120	.118

are obtained from Tables such as I and II. Similar tables have been developed for Uniform Skies, Overcast Skies, and Uniform Ground Conditions.

This technique permits the prediction of multilateral daylighting design by investigating each fenestration independently. It is a companion to the daylight prediction method for adjustable horizontal louvers,[1] and is one of a series of daylight prediction techniques being developed for the Libbey-Owens-Ford Glass Company. The full series will cover most practical daylighting designs, thus enabling the architect and illuminating engineer to compare alternate designs under a variety of natural conditions. It permits integration of daylighting and artificial lighting design.

Reference

1. Griffith, J. W., Conover, E. W., and Arner, W. J.: "Daylighting Design with Adjustable Horizontal Louvers," ILLUMINATING ENGINEERING, Vol. LII, No. 2 (February 1957).

(Abstract of I.E.S. Conference Paper No. 32.)

A Photographic Method Of Brightness Measurement

C. Marsh

E. Marsh

BRIGHTNESS can be measured by a photographic technique which records every point of a selected brightness in a scene. Since the recording is made from a photograph, by processing the negative to extreme contrast, measurements may be made rapidly and completely, over a wide range of brightnesses, and of very small areas. Hence, this method is useful for measuring changing subjects, as in daylighting studies, and for complete examination of small details as in models of proposed structures and lens elements of molded glass.

AUTHORS: Pennsylvania State University, University Park, Pa. Sponsored by the Pittsburgh Plate Glass Co.

(Abstract of I.E.S. Conference Paper No. 30.)

Next Year's Conference Papers

Deadline for outlines of next year's conference papers will be December 31, 1957. The earlier date of the conference next year (August 17-22, 1958) has necessitated an earlier deadline for the Papers Committee consideration of proposed papers. Those wishing to present papers before the 1958 conference in Toronto should submit outlines of them, not later than December 31, 1957, to:

Mr. H. F. Davidson, Chairman, Papers Committee
Curtis Lighting of Canada, Ltd.
195 Wicksteed Ave.
Leaside, Toronto 17, Ont.

Abstracts of
I.E.S. Conference Papers on

Photometry and Colorimetry

A New Look at the Measurement Of Light and Color

Deane B. Judd

SINCE 1935 the standard definition of light has been based on a luminous-efficiency function first adopted provisionally by the International Commission on Illumination (CIE) in 1924. This function was intended to give the reciprocal of the spectral radiance required to make each part of the spectrum appear equally bright to the average normal eye, and new determinations during the last 30 years indicate that the standard luminous-efficiency function succeeds very well in doing this for standard photometric conditions except perhaps that it may be too low in the short-wave portion (less than 460 mμ).

At the 1955 Sessions of the CIE in Zürich, Dr. W. S. Stiles of the National Physical Laboratory, Teddington, presented preliminary results of determinations of the color-mixture functions that suggested an entirely new basis for the definition of light. This new basis is that the function of wavelength defining light shall ensure that any two areas that color match even though the radiant energy leaving them has different spectral compositions (such areas are called metameric pairs) likewise have equal luminances.

AUTHOR: National Bureau of Standards, Washington, D. C.

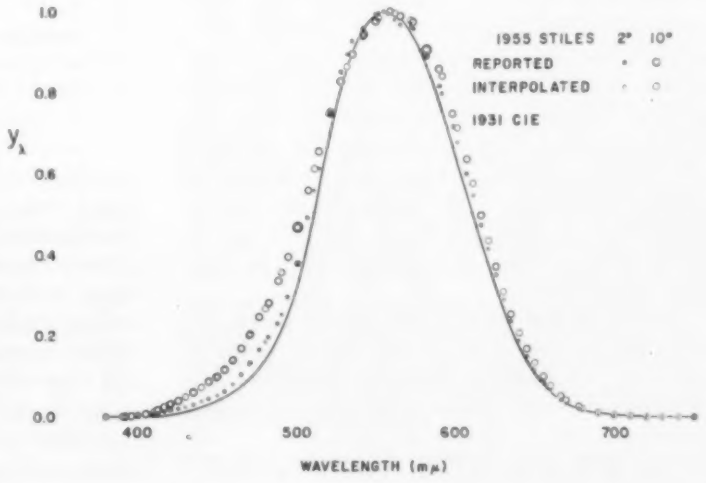


Figure 1. Comparison of the C.I.E. standard luminous-efficiency function with weighted sums of the 1955 Stiles' preliminary color-mixture functions for observing fields subtending 2 and 10 degrees. The weights were adjusted so as to give the same luminance ratio between a black body at a temperature of 2799K (intensity and flux standards for gas-filled lamps) and one at 2042K (standard of light). Note that the weighted sums give wavelength functions broader than the C.I.E. standard luminous-efficiency function. No other weights produce importantly better agreement.

In 1935 it was generally supposed that the standard luminous-efficiency function, which succeeds well in ensuring that the various parts of the spectrum would appear equally bright if viewed at constant luminance by this definition, would ensure that combinations of these parts having equal luminances would also appear equally bright, and, in particular, such of these combinations as have equal chromaticities would, of course, appear equally bright. Almost immediately published reports of failures of areas of constant luminance to appear equally bright began to appear (Kohlrausch, 1935; Dresler, 1938; Jaggi, 1939; MacAdam, 1950; Dresler, 1953; Chapanis and Halsey, 1955; Sanders and Wyszecki, 1957) and Stiles' 1955 preliminary data indicated that areas forming metameric pairs fail to have equal luminance by the 1935 definition of light. It is not possible by any weighted sum of these preliminary color-mixture functions to duplicate within experimental uncertainty the standard luminous-efficiency function. Fig. 1 compares the standard luminous-efficiency function with weighted sums of Stiles' color-mixture functions for 2-degree and 10-degree fields, the weights being adjusted so as to produce the best, or nearly the best, approximation to the standard luminous-efficiency function. The failure of the preliminary color-mixture functions for the 2-degree field to agree with the standard luminous-efficiency function indicates that there is a significant difference between the old and new basis for defining light, and the relative advantages of these bases are discussed in some detail.

The new basis for defining light also implies a new basis for defining color. The 1931 CIE standard observer defining color was derived to satisfy perfectly the old basis for defining light; that is, it was based partly on observations of color match and partly on the standard luminous-efficiency function derived from heterochromatic brightness matches. The new basis for defining light implies that new color-mixture functions be adopted that are based wholly on color matching data.

(Abstract of I.E.S. Conference Paper No. 7.)

Measurement and Specification of Color Rendition Properties of Light Sources

Dorothy Nickerson

The color distortion caused by spectral differences in light sources of the same color is one problem in color rendition. This is simple compared to the problem which involves a shift in color as well as spectral composition, for the eye adapts itself to chromatic shifts. Formulas for color rendition must take into consideration the observer's color vision and state of adaptation, as well as the spectral composition of the object and light source, if they are to predict correctly the color an observer will perceive. It is the net shift we must hope to predict.

One of the first problems in color rendition concerns the selection of a standard against which results may be compared. What is needed is a one-dimensional series with continuous, reasonably smooth spectroradiometric curves that cover the range from yellowish to bluish whites. The Planckian series is satisfactory in the color range of incandescent tungsten lamps, but in the wider range of daylight colors use of the Abbot-Gibson series is suggested. In this series the end points are Abbot's measurement of sun-outside-the-atmosphere and limit-blue-sky, calculated according to Gibson's suggestion by use of the Rayleigh scattering equation ($1/\lambda^4$). Tabular data are provided for several members of this series.

Author: United States Department of Agriculture, Agricultural Marketing Service, Washington, D. C.

TABLE I — Color differences between 18 samples under 6500 K.

Color Sample Munsell Notation	No.	Δ Hue		Δ Value		Δ Chroma		ΔE_u		Deluxe (x, y)-distance	Std. (x, y)-distance
		Deluxe	Std.	Deluxe	Std.	Deluxe	Std.	Deluxe	Std.		
5 Y 6/4	1	+0.5	+1.0	0	0	0	+0.1	0.9	2.1	15	35
10 Y 6/6	2	+0.5	+0.5	0	+0.1	+0.1	+0.2	1.8	2.7	30	40
2.5 GY 6/6	3	+0.5	0	+0.1	+0.1	+0.1	+0.2	2.3	1.2	30	40
5 GY 6/8	4	+0.3	−0.2	0	0	+0.2	+0.2	1.4	1.2	40	45
7.5 GY 6/6	5	0	−0.5	0	0	+0.2	0	0.6	1.5	40	60
10 GY 6/6	6	−0.3	−0.9	0	0	+0.2	−0.2	1.4	3.1	45	65
2.5 G 6/6	7	−0.3	−1.2	0	−0.1	+0.1	−0.6	1.1	5.8	20	70
10 G 6/4	8	−0.6	−0.9	0	0	0	−0.5	1.0	2.9	20	55
10 BG 6/4	9	0	+1.0	0	−0.1	−0.1	−0.4	0.3	3.2	15	45
10 B 6/4	10	+0.5	+1.5	0	0	−0.1	−0.4	1.0	2.7	10	35
5 PB 6/8	11	+1.0	+1.5	0	0	−0.2	+0.2	2.8	3.9	30	40
10 PB 6/8	12	+0.5	0	0	0	+0.9	+1.0	4.0	3.0	55	65
2.5 P 6/8	13	0	−0.5	0	0	+0.5	+0.5	1.5	3.1	40	50
5 P 6/8	14	−0.3	−1.0	0	0	+0.5	+0.5	2.4	4.8	40	60
10 P 6/8	15	−0.5	−0.5	0	−0.1	+0.4	0	2.6	4.8	40	75
5 RP 6/6	16	−1.0	−1.0	0	−0.1	+0.1	−0.3	2.3	3.5	25	35
7.5 R 6/4	17	−0.5	+2.0	0	0	0	−0.4	0.8	4.4	15	35
7.5 YR 6/4	18	−0.5	+1.5	0	0	0	−0.1	0.7	2.4	15	25
Avg Diff.		0.4	0.9	0.0	0.0[a]	0.2	0.3	1.6	3.1	29	48

Another problem in color rendition is that of specifying colorimetric results on a network that represents uniform spacing. There is a concept of equally perceptible color differences regardless of light source. But a distinction must be made between the concept and its representation, for when the concept is represented by samples, these must be for a single set of conditions. When the Munsell concept of hue, value, and chroma was first illustrated in painted scales, the work was done in daylight, and colorimetric studies since then have been in terms of CIE Source C. Studies of uniform color spacing for so extensive a series of samples are not available for a light source other than daylight.

Some way for simultaneous presentation of calculated and observed data for several light sources is a necessity, and Adams' Chromatic Value diagram illustrates one possibility. This diagram also permits a study of the relations reported by the work of Helson and Burnham and their co-workers for several light sources. More such studies are needed, for we do not now have nearly enough precise information to make the conversions required to solve the problem of color rendition.

Eventually we need a network representing uniform color spacing applicable to any light source of interest. We need a designation (such as the CIE) that can be calculated from measured data, and a designation (such as the Munsell) that will represent the appearance of a color, with some method by which these can be converted from one to the other for light sources other than daylight — for any light source, sample, observer, or background.

This would allow us to take full advantage of the Munsell notation and develop a formula for color rendition that could be based on color differences, either with hue, value, and chroma components, or of "total" color difference, whichever is of more immediate concern in a given problem. There would be the added advantage that studies made either for a series representative of all colors, or they could be restricted to colors that might be of particular interest. The sort of breakdown that could be made is illustrated in Table I which includes data for a series of 18 samples calculated for a standard lamp of filtered incandescent at 6500 K and for de luxe and standard fluorescent lamps at 6500 K. The numbers represent differences in appearance for the samples under the fluorescent lamps using the appearance under the filtered-incandescent as a standard. As the table shows, the average differences in color appearance, whether in terms of total difference, or in hue, value or chroma components, are greater under the standard fluorescent than under de luxe fluorescent. For some colors there is a + difference, for others a − difference. A breakdown of average results, such as reported in Table I, provides a great deal of useful information. Indeed, it provides a very meaningful method for developing an index of color rendition.

The paper refers to the work of the subcommittee on color rendition, and includes illustrations of the application of color difference formulas to color samples viewed under lamps at 3500 K, 4500 K, and 6500 K, with relative energy curves provided for these lamps. The size and direction of color changes calculated by use of the recent Burnham prediction formula is illustrated.

(Abstract of I.E.S. Conference Paper No. 6.)

The Spectral Luminosity of Fluorescent Lamps

Charles W. Jerome

THE SPECTRAL energy distribution of light sources is one of their fundamental data. From these, color parameters may be computed and they give an insight into the rendition of colors. Brightness, or lumen output, can also be computed therefrom by the formula:

$$B = K \int E_\lambda y_\lambda d\lambda$$

where B = brightness
K = a constant whose value depends on the units in which B is desired
E_λ = spectral energy distribution
and $\bar{y}_\lambda$ = spectral sensitivity of the eye.

Therefore, the curve of the product, $E_\lambda \bar{y}_\lambda$, as a function of wavelength gives a picture of the spectral luminosity of the source and the total area under this curve is proportional to the brightness, or lumen output.

A comparison between spectral energy and spectral luminosity curves for standard fluorescent whites is shown in the attached figures.

These data can also be presented by other methods[1] using non-uniform spacing of the wavelength scale whereby the spectral regions are emphasized in proportion to the sensitivity of the eye. This has suggested other modes of presentation whereby the ends of the spectrum are emphasized. It is these latter regions which are of particular importance in the rendition of colors. Therefore, this type of presentation makes possible an easier evaluation of the color rendering properties of the sources.

AUTHOR: Sylvania Electric Products Inc., Salem, Mass.

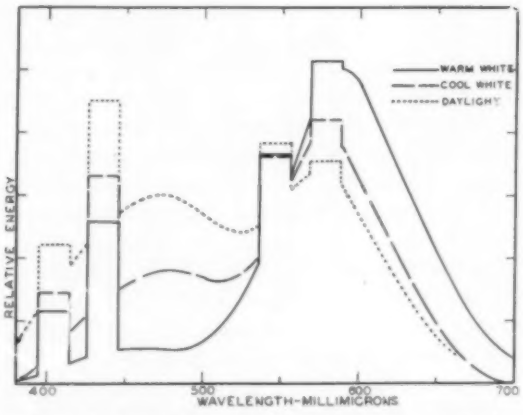


Figure 1. Spectral energy distributions — standard white fluorescent lamps.

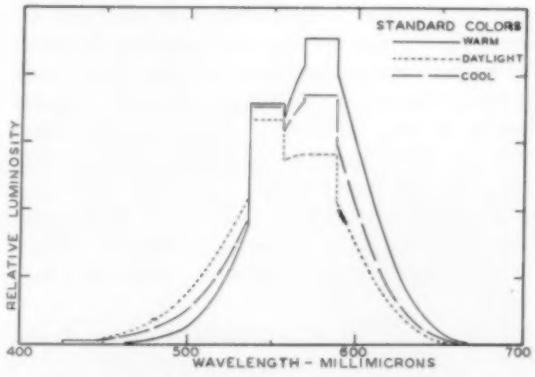


Figure 2. Spectral luminosity — standard fluorescent lamps.

1. Butler, K. H.: "The Design of Fluorescent Lamp Phosphors," ILLUMINATING ENGINEERING, Vol. XLIV, p. 267 (1949).

(Abstract of I.E.S. Conference Paper No. 8.)

Abstracts of
I.E.S. Conference Papers on

Calculations

Approximations and the Interflection Method

Domina Eberle Spencer

CONSIDERABLE interest has been shown by the Society in the accuracy of the interflection method. Discrepancies may arise from inherent characteristics of the interflection method such as the use of approximate exponential kernels or the assumption of wall uniformity at any level; or from the characteristics of model rooms or from difficulties with the experimental technique. In a previous paper[1] a method has been derived of obtaining an exact solution of the integral equation. By comparing this solution with previous tabulated values which employ exponential kernels, the effect of these exponential approximations can be investigated.

AUTHOR: Associate Professor, University of Connecticut, Storrs, Conn.; Consultant, Marlux Corp.

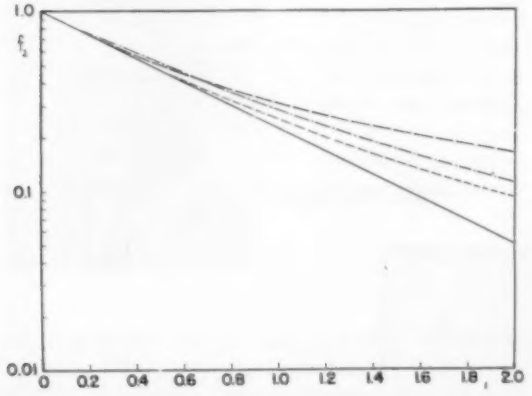


Figure 1. Interflectance f_2 as a function of domance, k_r, for rooms with luminous ceilings and black walls and floor.

Exponential approximation, Eq. (8) ————
Exact expression for
circular rooms, Eq. (9) - - - - - - - - -
square rooms, Eq. (11) —·—·—·—
very long rooms, Eq. (10) —— —— ——

The present paper applies this method to two extreme cases. The first is the case of luminous ceilings in rooms with black walls and floors. Here there are no interflections and the interflection method can be expected to exhibit maximum errors. The *interflectance* f_2 is plotted as a function of *domance** k_r in Fig. 1. The exponential approximation is given as well as exact values of interflectance for circular rooms, square rooms and infinitely long rooms. Even in this adverse case the discrepancy is less than 10 per cent over most of the practical range ($k_r<1$), but increasingly large discrepancies occur in very high, narrow rooms. For $k_r>1$ the concept of domance* loses its unique significance. If luminous ceilings are employed in "black broom-closets," no single interflectance table can adequately represent all room shapes.

Now consider the practical case in which interflections become important. The worst case will occur for very long rooms with $k_r=1$. This is an infinitely long corridor whose height is twice its width. So that the contribution from interflections will be large, consider the highest values of reflectance for which tables have been published, $\rho_1=\rho_2=0.80$, $\rho_3=0.50$. The resulting exact and approxi-

*Index of room proportion.

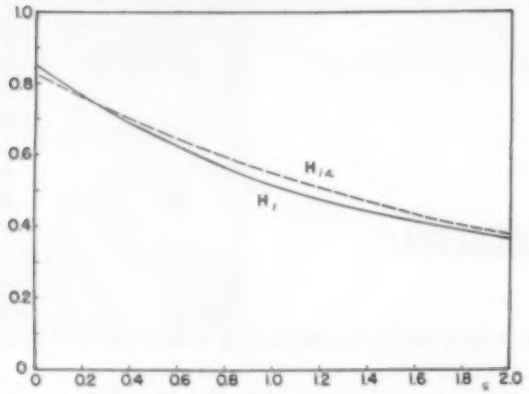


Figure 2. Exact and approximate distribution of light on walls of a very long room with ceiling lighting, $k_r = 1$. $\rho_1 = \rho_2 = 0.8$, $\rho_3 = 0.5$. Values are referred to $H_{02} = 1$.

mate distributions of light on the walls of the corridor are shown in Fig. 2.

Conclusions can be drawn on the effect of approximate exponential kernels in the interflection method, for rooms lighted with luminous ceilings. The approximate solution is exact for very large rooms ($k_r=0$). Discrepancies increase as reflectances are lowered and as rooms become smaller (k_r becomes larger). The method utilized in this paper yields correction factors which may be applied to each type of room cross-section, but their use in general application is not recommended. The discrepancies calculated in this paper are in agreement with those obtained in the excellent experimental work of Churchill and Putnam.[2] Published interflection tables can be regarded adequate for practical lighting calculations in which discrepancies up to ten per cent are unimportant. If an accuracy of one per cent is desired and if detailed corrections for the effect of furniture are utilized, then the correction factors tabulated in the paper should be employed.

References

1. Moon, Parry, and Spencer, D. E.: "Errors in the Solution of Integral Equations," *Journal of the Franklin Institute*, to be published.

2. Churchill, R. D., and Putnam, R. C.: "Verification of the Interflection Tables," ILLUMINATING ENGINEERING, Vol. LII, No. 1, p. 23 (January 1957).

(Abstract of I.E.S. Conference Paper No. 16.)

Interreflections in Asymmetrical Rooms

Philip F. O'Brien

DURING the past forty years a large body of experimental and analytical data necessary to the calculation of luminances and illuminations in rooms has been prepared for the lighting designer. These design data have been reported largely for rooms whose luminous flux inputs and surface reflectances are located symmetrically with respect to a vertical axis at the room center. In order to extend the lighting design data to asymmetrical systems an analytical method for the prediction of lighting parameters has been developed. This analytical method is based on a network representation[1] of the flow of luminous flux in a room.

An infinitely long room as shown in Fig. 1 has been analyzed using the network representation. Luminous flux is introduced into the long room via two diffuse panels located in the ceiling and one wall. These luminous sources are labeled as lamplight and daylight panels simply because of their relative position in the room. The initial luminous emittances L_{01} and L_{04} (i.e., without interreflections) are arbitrarily set equal to unity. The room surfaces are divided into ten areas whose relative dimensions and luminous reflectances are shown in Fig. 1.

AUTHOR: Department of Engineering, University of California, Los Angeles, Calif.

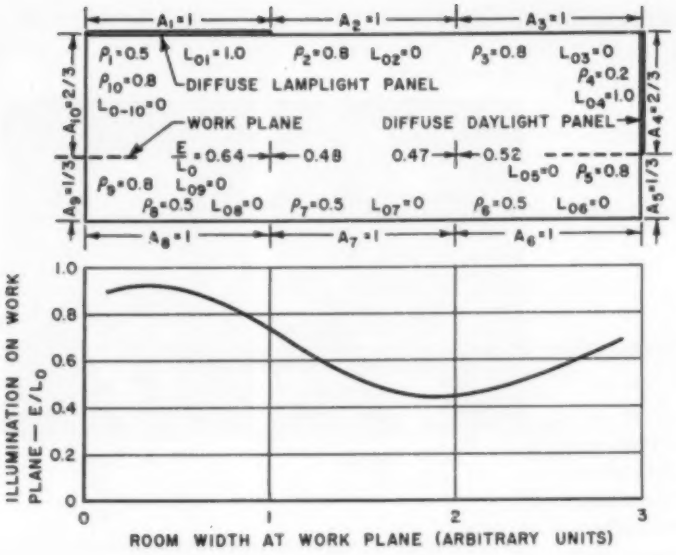


Figure 1. Elevation view of an infinitely long room with combined daylighting and lamplighting; initial luminous emittances L_{01} and L_{02} equal unity; illuminations expressed relative to the initial luminous emittances.

With the flux inputs, geometry and reflectances described above, the illumination as a function of position on the horizontal work plane of the long room is plotted in Fig. 1. In addition, the illuminations on four vertical planes at work plane level are shown.

The illuminations reported in Fig. 1 were computed using an electrical analogue computer, the Luminous Analogue Computer,[2] which has recently been designed and constructed at the Department of Engineering, University of California, Los Angeles. As shown in Fig. 2 the Luminous Analogue Computer consists in three racks containing variable resistances and power supplies. The ten groups of three variable resistors on the left side of the central rack are set so as to represent the reflectances of ten areas that form the boundary of a room. Forty-five pairs of resistors representing room geometry are located to the right of the surface reflectance resistors. The luminous flux inputs are set by means of variable autotransformers which are located on the left-hand rack. The output of the device is a set of voltages which appear at the ten jacks near the middle of the central rack. This set of voltages is related to the total luminous emittances of the room surfaces including the effect of interreflections.

The prediction of luminance and illumination distributions in rooms with asymmetrical locations of luminous sources and surface reflectances may be accomplished by the use of the analytical method described in this paper. Both analogue and digital techniques are applicable to the solution of the finite difference equations which specify the flow of luminous flux in a room.

References

1. O'Brien, Philip F.: "Interreflections in Rooms by a Network Method," *Journal of the Optical Society of America*, Vol. 45, No. 6, pp. 419-424 (June 1955).
2. O'Brien, Philip F.: "A Luminous Analog Computer," *Journal of the Optical Society of America*, Vol. 47, No. 1, p. 118 (abstract), January 1957.

(Abstract of I.E.S. Conference Paper No. 15.)

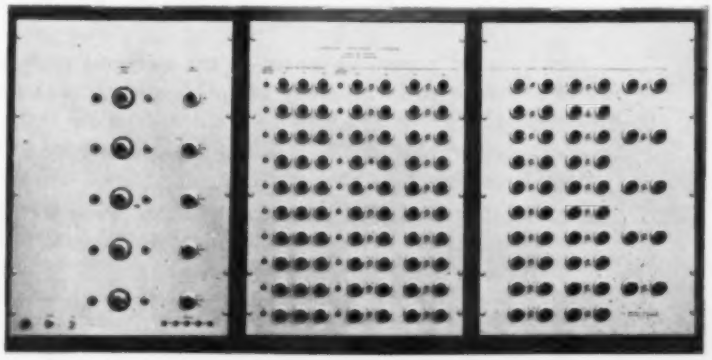


Figure 2. The Luminous Analogue Computer of the Department of Engineering, University of California, Los Angeles; vacuum tube voltmeter for output measurements not shown.

Automatic Processing of Photometric Test Data For Street Lighting Luminaires

G. A. Horton

P. A. Zaphyr

THERE are three steps in the photometric analysis of a new design of street lighting luminaire:

(1) The recording of the test data.

(2) Reducing these data to measures of light utilization and luminaire efficiency.

(3) Plotting curves of equal luminous flux density on the street surface, or iso-footcandle curves.

Modern high speed digital computers can be programmed to perform many of the routine and laborious tasks in the processing and analysis of engineering and scientific test data. Various computers such as the IBM Type 602A electro-mechanical calculator, the IBM Type CPC computer and the IBM 650 have been used in the past to process luminaire test data. Recently, a modern high speed, internally programmed digital computer, the IBM Type 704, has been applied to the reduction of luminaire test data.

This paper describes an automatic system for performing the above mentioned computations and the iso-footcandle curves are plotted by means of a high speed printer using Lagrange's interpolation formula.

An automatic system such as this makes possible the speedy and error-free processing of data in approximately 13 minutes which previously required about 30 hours of human effort.

(Abstract of I.E.S. Conference Paper No. 14.)

AUTHORS: Westinghouse Electric Corp., Cleveland, Ohio, and East Pittsburgh, Pa., respectively.

Discussion of I.E.S. Conference Papers

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Abstracts of
I.E.S. Conference Papers on

Research

The Effective Intensity of Flashing Lights

Theodore H. Projector

THE EFFECTIVE intensity of a flashing light is defined as the intensity of a steady light that appears equally intense under the same conditions of observation. Comparative observations between steady and flashing lights are difficult to make but if the level of illuminance is not too far above threshold, say, not more than about 25-50 times threshold, fairly reliable results can be obtained. When the illuminance is very high it is difficult for observers to distinguish between the judgments "equally intense" and "equally irritating." It is recommended therefore that the concept of effective intensity be applied only to conditions of observation involving low illuminances.

Blondel and Rey,[1] in 1911, reported the results of their classical work on the effective intensity of flashing lights. The general form of the Blondel and Rey equation is

$$I_e = \frac{\int_{t_1}^{t_2} I\,dt}{a+(t_2-t_1)}$$

where I_e is the effective intensity, I is the instantaneous intensity during the flash, t_1 is the time of onset of the flash, t_2 is the time at which the flash terminates, and a is a constant dependent on the level of illuminance at the observer. For threshold illuminance, Blondel and Rey found a to be equal to 0.21, a value amply confirmed by subsequent research, although it is generally rounded to 0.2 to conform with the inherent inaccuracies of measurements of this type. At illuminances above threshold, a decreases. Fig. 1 shows the relation between the effective intensity, I_e, and the flash duration t (equal to t_2-t_1), for flashes of equal luminous energy.

Analysis of the Blondel-Rey equation shows that there are two limiting relationships among the variables. When the flash duration is short, that is when t is appreciably less than a, the intensity and the duration time are reciprocal and the effective

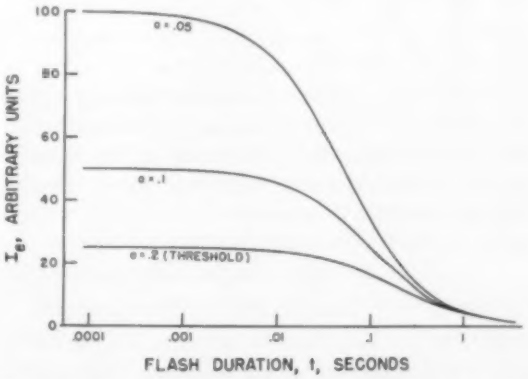

Figure 1. Effective intensity, I_e, as a function of flash duration, t, for flashes of equal energy, at $a = 0.2$ (threshold illuminance), 0.1 and 0.05.

AUTHOR: National Bureau of Standards, Washington, D. C.

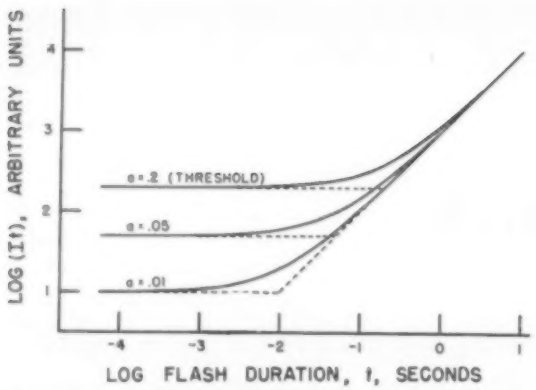

Figure 2. Flash energy (plotted as It) required to produce a given effective intensity, as a function of flash duration, at $a = 0.2$ (threshold illuminance), 0.05 and 0.01.

intensity is proportional to the luminous energy in the flash. The reciprocal relation is represented by the horizontal portion at the left of the curves in the figure. On the other hand, when the duration time is long, that is, when t is appreciably greater than a, the effective intensity approaches equality with the instantaneous intensity during the flash if the instantaneous intensity is constant, or with the average intensity if it fluctuates. This latter aspect of the Blondel-Rey equation is not clearly evident in Fig. 1, but if the equation is plotted in the form of Fig. 2, the two terminal relationships are evident. In Fig. 2, the ordinate scale, *log It*, represents the quantity of luminous energy required to produce a given effective intensity for flashes of square form in which the instantaneous intensity, I, is constant during the flash. In Fig. 2, the projections of the straight lines representing the terminal relationships intersect at a point whose abscissa is the "critical duration" defining the boundary between the two parts of the curve.

Since the classical work of Blondel and Rey there has been a considerable body of research bearing directly or indirectly on effective intensity. Many parameters such as color, level of illuminance, and wave shape have been studied, and durations have been extended down to the microsecond region. The weight of all the evidence supports the general applicability of the Blondel-Rey equation, at least in the low-illuminance region, although there are many areas in which additional research work would be helpful.

Reference

1. A. Blondel and J. Rey: "The Perception of Lights of Short Duration at Their Range Limits," *Transactions IES*, London, Vol. VII, No. 8, p. 625 (November 1912). This paper is a complete account in English of the material contained in two papers published in 1911 in the *Journal de Physique*, Vol. I, Series 5, page 530 and page 643.

(Abstract of I.E.S. Conference Paper No. 9A.)

Computation of the Effective Intensity Of Flashing Lights

Charles A. Douglas

It is convenient to evaluate flashing lights in terms of their effective intensity, I_e, that is, the intensity of a fixed light which will appear equally bright. Blondel and Rey found that for an abrupt flash at threshold illuminance

$$I_e = \frac{It}{a+t}, \qquad (1)$$

where I is the instantaneous intensity, t is the duration of the flash, and a is a constant. They found that a was equal to 0.21 when t is in seconds.

AUTHOR: National Bureau of Standards, Washington, D. C.

The flash from most lights used in aviation service is not abrupt and in many instances equation (1) is not applicable to the computation of the effective intensity. When the specification for aircraft anti-collision lights was being prepared, it

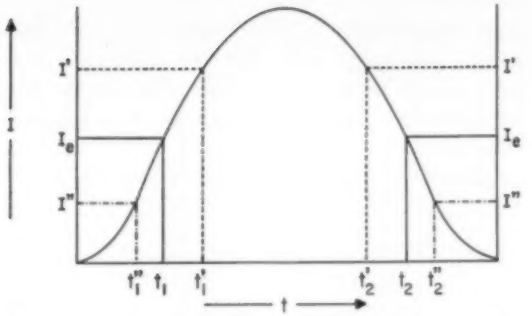

Figure 1. A simple intensity-time distribution illustrating the method of obtaining the maximum value of effective intensity. The maximum value of the effective intensity, I_e, is obtained when the times t_1 and t_2 are the times when the instantaneous intensity is equal to I_e.

was suggested that the effective intensity be computed by means of equation (2),

$$I_e = \frac{\int_{t_1}^{t_2} I\,dt}{.2 + t_2 - t_1} \qquad (2)$$

An equation of this form was originally suggested by Blondel and Rey, but has rarely been used. The principal problem in the use of this equation is the proper choice of the limits t_1 and t_2. It was proposed that these times be so chosen to make the value of I_e a maximum. The development and application of a method, other than trial and error, of obtaining the maximum value of I_e is the purpose of this paper.

It can be easily shown that I_e is a maximum when the limits t_1 and t_2 are the times when the instantaneous intensity is equal to I_e. (See Fig.1.) It can also be shown that if the limits t''_1 and t''_2 are used, the computed value of instantaneous intensity will be between I'' and I_e. If the limits t'_1 and t'_2 are used, the computed value of instantaneous intensity will, of course, be less than I_e. Thus the maximum value of I_e may be readily obtained in a very few steps by using as the limits of each step the times corresponding to the computed value of I_e obtained in the preceding step.

Since a change in the times chosen as the limits in equation (2) changes the denominator and the numerator in the same direction, it is not necessary to determine the correct limits, t_1 and t_2, with great precision in order to obtain a satisfactorily precise determination of I_e. This is illustrated in Fig. 2 which shows two representative intensity-time distributions, one for a flashing light with a flash duration of about ¼ second, and one with a flash duration of about $^1/_{20}$ second. The values of I_e are computed for seven sets of time limits. The values obtained are indicated at the abscissa of the time limits used in the computation. The middle value of each group is the maximum I_e computed according to the method outlined above. Note that this value is equal to the instantaneous intensity at the corresponding time limits. Typically, the maximum effective intensity occurs lower on the curve for the short duration flash than for the long one and the variation of computed values of effective intensity with changes in time is smaller.

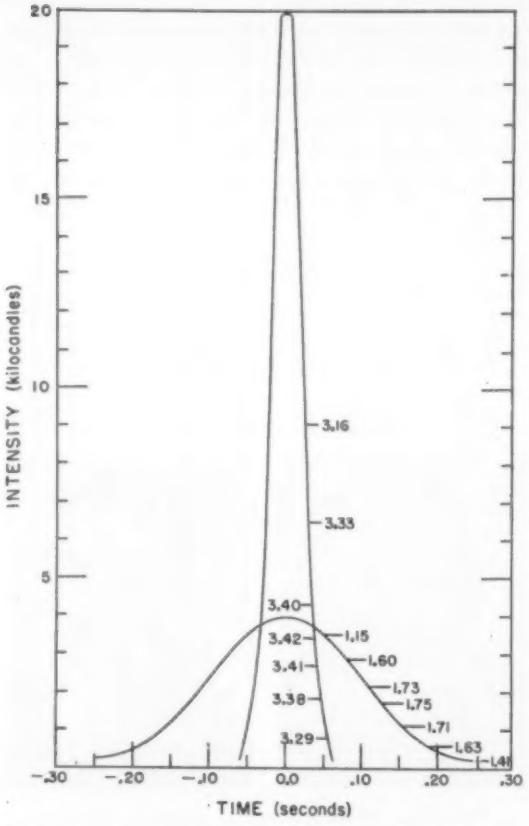

Figure 2. Intensity time distributions illustrating the effect of choice of time limits on the computed effective intensity. The effective intensities are shown at the abscissa of the time limits used in the computations.

Concern has frequently been expressed about the choice of the limits for the integral of the Blondel-Rey relation for computing the visual range of a flashing light. It seems illogical to extend the limits of the integral beyond the times when the instantaneous intensity is below the threshold intensity

for steady burning lights so that intensities which are below threshold, even for a steady burning light, are included, or to exclude intensities which are above threshold for steady burning lights. Using this reasoning, Blondel and Rey suggested that the limits of the integral of equation (2) be the times when the instantaneous intensity is equal to the threshold intensity. These are also the limits which make the effective intensity and hence the computed visual range of the light a maximum. Therefore, the use of these limits in evaluating the performance of a lighting unit appears to be a logical choice.

(Abstract of I.E.S. Conference Paper No. 9B.)

Russell C. Putnam

Keith D. Bower

Discomfort Glare at Low Adaptation Levels—Multiple Sources

THE QUESTION of discomfort glare is of great interest to the illuminating engineer. Lighting design for interior lighting applications has long been concerned with visual comfort and the avoidance of discomfort glare. In the last few years, also, it has been growing in importance in the consideration of engineers engaged in street and highway lighting.

Various techniques have been used by past researchers to study the glare problem. The BCD criterion as developed by Luckiesh and Guth[1] (the borderline between visual comfort and discomfort) has been used in previous research work done at Case Institute of Technology,[2,3] and is the visual sensation rating used in this study. This present investigation continues the researches with studies of how the borderline brightnesses between comfort and discomfort change with angle above the horizontal for varying background brightnesses (adaptation levels), source sizes, and for different combinations of multiple sources. The glare sources used are the same visual sizes as typical street lighting luminaires and the adaptation brightnesses are typical of the surround brightnesses encountered in street lighting applications at night.

The present investigation consisted of four parts. First the observers made BCD measurements of a circular source alone on the line of vision in order to tie in the results of this group of observers with those of previous investigations.[2,3] Then a study

AUTHORS: Case Institute of Technology, Cleveland, Ohio.

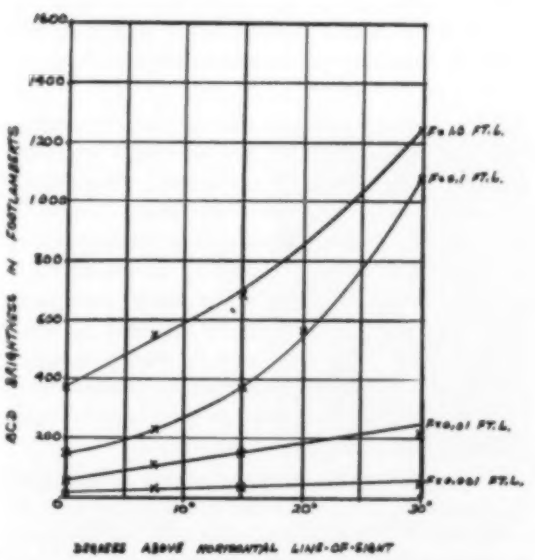

Figure 1. Relationship between the BCD brightnesses of a source, subtending a solid angle of 0.0001 steradian, and the angle above the horizontal line of sight for four different background brightnesses (F).

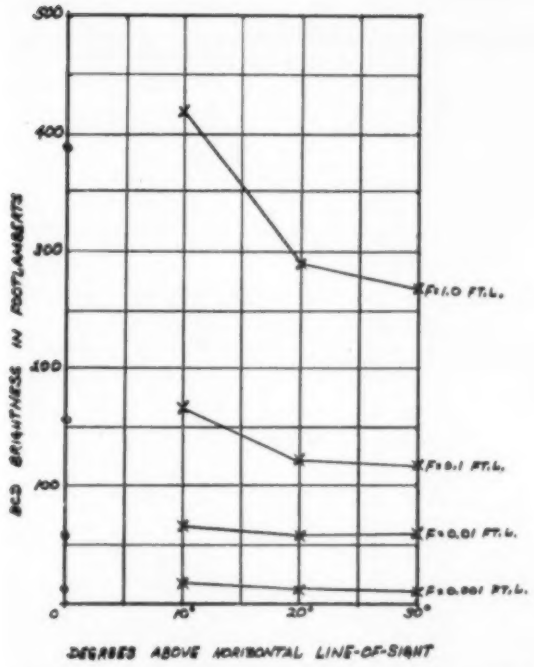

Figure 2. Relationship between the BCD brightnesses of simulated fluorescent street lighting sources and the angle above the horizontal line of sight for four different background brightnesses (*F*).

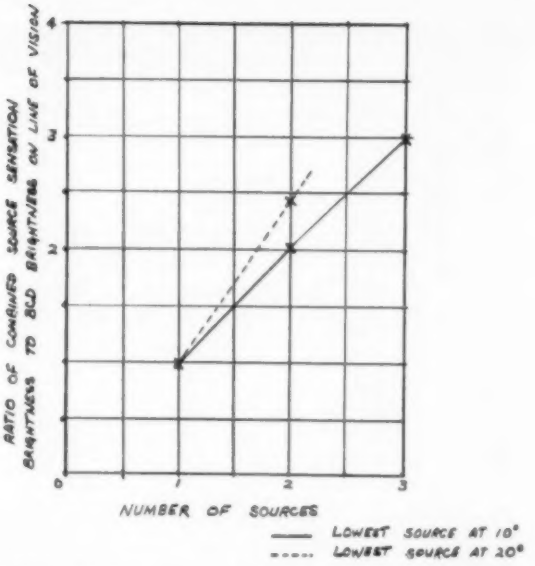

Figure 3. Fluorescent multiple sources. Relationship between the sensation brightnesses of simulated fluorescent street lighting sources and the number of sources located in various combinations at 10°, 20°, and 30°.

was made of the BCD brightness of a single source above the line of vision for background brightnesses of from 0.001 to 1.0 footlambert. The third part consisted of studies of simulated incandescent and fluorescent sources at ten, twenty, and thirty degrees above the horizontal line of sight, the simulated fluorescent readings being taken for a range of background brightness also of from 0.001 to 1.0 footlambert. Finally, the simulated incandescent and fluorescent sources were combined to get the effect of multiple sources.

The four curves in Fig. 1 show how the BCD brightness of a source increases as its angle above the direct line of vision is raised. The curves for background brightness of 1.0 footlambert and 0.1 footlambert show trends similar to those developed by Luckiesh and Guth[1] for a background level of ten footlamberts and also to that of Petherbridge and Hopkinson.[4] The two curves which indicate BCD brightness variation under respective adaptation levels of 0.01 footlambert and 0.001 footlambert, show linear variation as the angle is varied, these changes corresponding closely to the curves published by Putnam and Gillmore. The four curves indicate a transformation from linear to exponential variation as the background is raised from .01 footlambert to 0.1 footlambert. It is speculated that the respective response and sensitivity characteristics of the rods and cones in the retina change radically at about this level.

In a practical street lighting condition, the visual size of luminaire increases along with the vertical angle as the distance from the driver decreases. Fig. 2 gives the results of such a study. At ten degrees there is a decided increase in BCD brightness over the BCD brightnesses observed at twenty and thirty degrees, the increase getting smaller with the lower background brightness conditions.

There is a very close correlation between the BCD brightnesses between the simulated incandescent-mercury sources and the fluorescent sources taken at the same background brightness (0.1 footlambert); the fluorescent source giving readings from 32 to 34 per cent of the simulated incandescent-mercury in every case (Table I).

In considering a realistic street lighting situation, the combined sensation from multiple sources must be taken into account. The results of this investigation show that the combined source sensa-

TABLE I.

	Fluorescent Average	Incandescent Average	Per Cent
10°	167 ft-L	525 ft-L	32%
20°	122 ft-L	360 ft-L	34%
30°	119 ft-L	370 ft-L	32%

tion brightness increases nearly linearly with the number of sources added in cases where one source is located at ten degrees above the line of vision. A pronounced departure from direct additivity, however, is noted when the two sources are both located near the periphery of the observer's visual field at 20 and 30 degrees (Fig. 3). This result was noticed by each observer, and the readings were spread out over a long period of time so that the departure cannot be attributed to extreme fluctuations or subjective influence. The same trend was shown for simulated fluorescent sources under general adaptation levels of 0.001, 0.01, 0.1 and 1.0 footlambert and for a simulated incandescent source at 0.1 footlambert.

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2. Putnam, Russell C., and Faucett, Robert E.: "The Threshold of Discomfort Glare at Low Adaptation Levels," ILLUMINATING ENGINEERING, Vol. XLVI, pp. 505-510 (October 1951).
3. Putnam, Russell C., and Gillmore, Willard F., Jr.: "Discomfort Glare at Low Adaptation Levels — II — Off Axis Sources," ILLUMINATING ENGINEERING, Vol. LII, pp. 226-232 (April 1957).
4. Discussion of "Discomfort Glare at Low Adaptation Levels — II — Off Axis Sources," Ralph G. Hopkinson and P. Petherbridge: ILLUMINATING ENGINEERING, Vol. LII, p. 230 (April 1957).

(Abstract of I.E.S. Conference Paper No. 23.)

Highway Visibility in Fog

Charles Marsh

This is a report of work to date on efforts to improve the performance in fog of fixed highway lighting, vehicle mounted lamps, front and rear, and fog actuated warning devices. Some gain has been made by directing light in directions having less scattering toward the driver, by minimizing the volume of illuminated fog between driver and road, and by using polarizing filters to further reduce scatter from fog droplets. Improvement is possible in rear lamps through changes in brightness, intensity, and position. Fog detecting devices under construction show promise but are not yet ready for trial installation.

AUTHOR: Pennsylvania State University, University Park, Pa.

(Abstract of I.E.S. Conference Paper No. 22.)

Annual Meeting

In accordance with Article VII Section 1 of the Constitution, the Annual Meeting of I.E.S. is scheduled to be held at Society Headquarters at 10 a.m., Thursday, October 10, 1957. The meeting will receive a report of the proceedings of the Society for the fiscal year 1956-1957.

R. G. SLAUER
General Secretary

INSTALLATION AT LOVE FIELD, DALLAS, TEXAS.

Lighting an Airport Parking Area

LIGHTING OBJECTIVE: To provide illumination in an airport parking area, for the comfort and safety of visitors, without having high luminaire brightness in the line of vision of the control tower operator.

GENERAL INFORMATION: The major portion of the parking area is located directly in front of the airport terminal building and control tower as can be seen in Fig. 2. The control tower operator is located approximately 35 feet above the ground. In his normal duties it is often necessary for him to look directly over the parking area.

INSTALLATION: Twenty-seven Westinghouse Type OV-20 luminaires (IES Type III distribution), mounted 31 feet above the pavement on Union Metal tapered steel transformer base standards with single 6-foot upsweep brackets, are installed along the perimeters of the individual parking areas. The standards are spaced approximately 100 feet apart. Each luminaire, shown in Fig. 3, is equipped with one 400-watt 21,000-lumen E-H1 mercury vapor lamp and one Westinghouse "cut-off visor" or "glare shield," style number 1569 771. The visor, or shield, is used to prevent the operator in the control tower from seeing the high brightness of the luminaire glassware.

(over)

A.I.A. File No. 31

Figure 2. Daytime view of parking area showing location of terminal building and control tower.

Figure 3. Close-up of luminaire, showing "cut-off visor."

The average level of illumination in the parking areas is 2 footcandles.

Pilots using Love Field claim that they can cut off their instruments fifteen minutes out of Oklahoma City and "home in" on the parking area lighting.

Lighting designed by B. E. Duffy, Regional Engineer, Westinghouse Electric Corp., Dallas, Texas.

Lighting data submitted by J. R. Bale, Lighting Division, Westinghouse Electric Corp., Cleveland, Ohio, as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Lighting for the Color Appraisal of Reflection-Type Materials in Graphic Arts

Prepared by Color Appraisal Task Committee of the Graphic Arts Subcommittee of the Industrial Committee of the Illuminating Engineering Society

Foreword

This report has evolved from the need for having a revision of the report titled, "Progress Report on Lighting in the Printing Industry," published in *Transactions of the Illuminating Engineering Society*, Vol. XXXI, No. 3 (1936), both for general illumination and for color in the graphic arts industry. In 1953, through the efforts of the Committee on Lighting Study Projects in Industry, Mr. J. Wallace Scott, Jr. of the graphic arts industry and Mr. Ralph Enghouser were made co-chairmen of a joint committee on lighting in the graphic arts-printing industry under the Research and Engineering Council of the Graphic Arts Industry, Inc. and I.E.S. The Joint Committee's first meeting was held in October of that year. In 1954 a color appraisal task committee was organized under the Joint Committee to establish standard conditions for the color appraisal of color copy and their photomechanical printed reproduction.

This report has been produced jointly by the Research and Engineering Council of the Graphic Arts Industry, Inc. and the Illuminating Engineering Society through its Graphic Arts Subcommittee of the Industrial Committee. For the first time, agreement has been reached on a proposed lighting arrangement for color work in the graphic arts industry, all the way from the advertising office to the finished published reproduction.

Color Appraisal Task Committee

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Approved by the Council of the Illuminating Engineering Society, July 1957.

Preface

(This Preface is presented as background material. It is not a part of "Lighting for the Color Appraisal of Reflection-Type Materials in Graphic Arts.")

Modern graphic arts color production requires skilled personnel supplied with precision equipment and visual aids if the finished work is to meet today's high-quality requirements. One of the major problems in producing finished work of quality is the ability to evaluate color correctly. In order to take steps to insure the adequacy of the observer's color sensation it is necessary to understand the following three factors that influence color appraisal: visual response, the light source, and the color property of the basic materials.

Visual Response.—The manner in which the normal eye responds to color is affected by the kind of light to which it is adapted. Under incandescent filament lighting, for example, the eye becomes less sensitive to reds and relatively more sensitive to blues. The converse is true for a bluish light source, such as north sky daylight.

Since all eyes vary somewhat in color sensitivity, it is important that only workers having normal color perception be selected to do critical color work. The American Optical H.R.R. Color Perception Test may be used for this purpose.

The eye is affected by excessive brightness and brightness differences in the field of view. Prolonged exposure to glare conditions tends to cause fatigue and eye strain.

The eye is further affected by the color of the surroundings, such as walls and interior decorations. The apparent color of an object is different when viewed in the presence of other colors. The use of medium neutral gray walls or surroundings will reduce color confusion.

For best color viewing, the color work should be done where extraneous light can be excluded, where brightness differences can be minimized, and where the light source can be positioned to eliminate direct and reflected glare.

Light Source. — The spectral characteristics of the light source play a major part in the appearance of a color sample.

The only fixed property of a colored object is its selective ability to reflect or transmit light. A blue sample appears blue simply because it reflects more blue light than any other color. From this it may be seen that the color composition or spectral characteristics of the light source used to illuminate the sample plays a major part in the color appearance of the sample. If a light source is deficient in any color, or if it has an overabundance of any color in its spectral composition, the apparent color of materials viewed under the light will be suppressed or accentuated accordingly. Therefore, where all colors are to be observed, it is necessary to provide a light source whose spectral composition insures the presence of all colors in reasonable amounts to avoid undue or unnatural color distortion.

A background of visual color experience has been built up over the years by graphic arts personnel. In this industry, as in other long established industries, the only light source available with reasonable spectral energy distribution (color composition) and in sufficient quantity has been daylight of one type or another. Traditionally, the graphic arts colorist has preferred the light from a north window because it is the least variable type of daylight. As a result, moderately overcast north sky daylight has come to be accepted as the best source for making accurate color appraisals. But north sky daylight varies considerably in quantity and spectral energy distribution (color composition) and is not always available. Consequently, there is a critical need to provide an electric light source that is constant, can be standardized, and can sufficiently duplicate or simulate north sky daylight. Such a light source (Sections 2 and 3) would enable the graphic arts colorist to continue using the color experience he has accumulated over the years under north sky daylight.

Color of Basic Materials (Pigments, Ink, Paper, Etc.). — The only fixed color property of the basic materials used in the graphic arts industry is the selective way they reflect and transmit light. Therefore, the color of the material viewed depends upon the spectral composition of the source of illumination. Basic materials can best be selected, formulated, or blended to achieve desired color results only when seen under standardized lighting and viewing conditions. Because the color of the basic materials depends on the selective way they reflect and transmit light and on the spectral composition of the light source, the standardization of lighting and viewing conditions between customer and supplier is vital. Everyone involved in making color appraisals should have the same basic seeing conditions in order that a fixed reference can be established.

1. Introduction

1.1—*General* — The visual color appraisal of graphic arts reflection type copy, proofs, and press sheets divides into four basic tasks. These must be clearly defined and understood because the precision of the lighting requirements for each is not necessarily the same. The four basic color tasks are: (1) original color selection (artist's choice of colors); (2) color matching of basic materials (selecting of pigments); (3) visual appraisal of "color quality" of printed result as compared with original color selection (proofs vs. copy); and (4) visual appraisal of "color uniformity" of production press

sheets with O.K.'d press sheets or approved proofs (result vs. proofs or O.K.).

1.2—*Original Color Selection*—(a) The selection of original colors is governed by many esthetic and economic factors, and only the originator is cognizant of the desired impression to be given the observer or consumer. Therefore, care should be taken that the desired result is inherent in the copy under the various lighting conditions that might be used by the observers when viewing the reproduction. Many color problems may be avoided by evaluating the copy under commonly used light sources as well as under the primary or secondary standard light sources (Sections 2 and 3). A standardized light source serves as a basis for making or specifying color corrections in order that a common understanding between customer and supplier may be established.

(b) If the original color selection is not made under commonly used light sources unsuitable colors may result in both the copy and printed reproduction. For example, assume that a greenish yellow hue has been selected for a package usually viewed in supermarkets. If the selection of the greenish yellow hue is made under north sky daylight only, it is possible that an effect not desired by the originator will result when the finished work is viewed under general lighting conditions prevailing in supermarkets. Had the original color selection been checked under the ultimate light conditions this undesired effect would have been observed and a more suitable color would have been selected.

(c) Even when the copy is properly selected and the printed reproduction closely resembles the copy under a standard light source the degree of resemblance under commonly used general lighting may vary, but the differences will be small.

1.3—*Color Matching of Basic Materials*—(a) The color characteristics of the basic materials used for reproduction may be different from those found in the original copy. As a result a metameric color match may occur. A metameric color match is an apparent match of a pair of colors when viewed under one light source but is a mismatch when viewed under most other light sources.

(b) Color metamerism is most easily detected when the comparison between a sample and match is made under two widely separated (spectrally dissimilar) light sources. One of the light sources should be the primary standard light source (Section 2), which is a close approximation to north sky daylight; the other light source may be an incandescent filament lamp. The validity of the electric daylight match is, therefore, checked under a second illuminant. (For fluorescent materials see Appendix.)

(c) Often it is impossible, or impractical, to exactly match the sample with the materials and equipment available, so a reasonable compromise must be made. Nonprocess inks offer considerable latitude in the selection of pigments for the formulation of the single color ink used to match the sample. Because of this latitude, there is greater possibility of color metamerism being eliminated or minimized. Process printing, on the other hand, is by its nature a metameric process and should be considered in two parts. First, the process inks magenta (process red), yellow (process yellow), and cyan (process blue) should and normally can be nonmetamerically matched against plant standards. Secondly, further adjustments are made in the individual ink-carrying plates to obtain best "color quality" as stated in Section 1.4.

1.4—*Visual Appraisal of "Color Quality"*—Assuming that the color selection of the original copy has been checked (Section 1.2) and, where possible, the basic materials have been color matched (Section 1.3), the next color task is to compare the "color quality" of the reproduction with the original copy. This may involve comparison of copy with proofs or with press sheets to determine the color corrections needed before the production run. This type of "color quality" comparison is the most important over-all color appraisal, and the light source used for this purpose should simulate north sky daylight as closely as possible. The primary standard light source (Section 2) is suitable for the comparison of "color quality" of the printed result with the original color selection.

1.5—*Visual Appraisal of "Color Uniformity"*—Once a proof or O.K.'d press sheet has been approved (Section 1.4), the next color task is the checking of the "color uniformity" by matching press sheet and proof. The lighting for this appraisal is less exacting than for appraising "color quality" because the materials consist of the same inks printed on the same stock. Departures from the spectral energy distribution of daylight are permissible here so long as the electric light source yields essentially the same visual result as that of north sky daylight. The secondary standard light source (Section 3) is suitable for visual appraisal of "color uniformity" of production press sheets.

2. Specific Recommended Requirements For Appraising "Color Quality"

2.1—*Terminology*—The light source for appraising "color quality" shall be designated as the Primary Standard Light Source (Section 1.4).

2.2—*Spectral Energy Distribution*—The design standard for the Primary Standard Light Source is

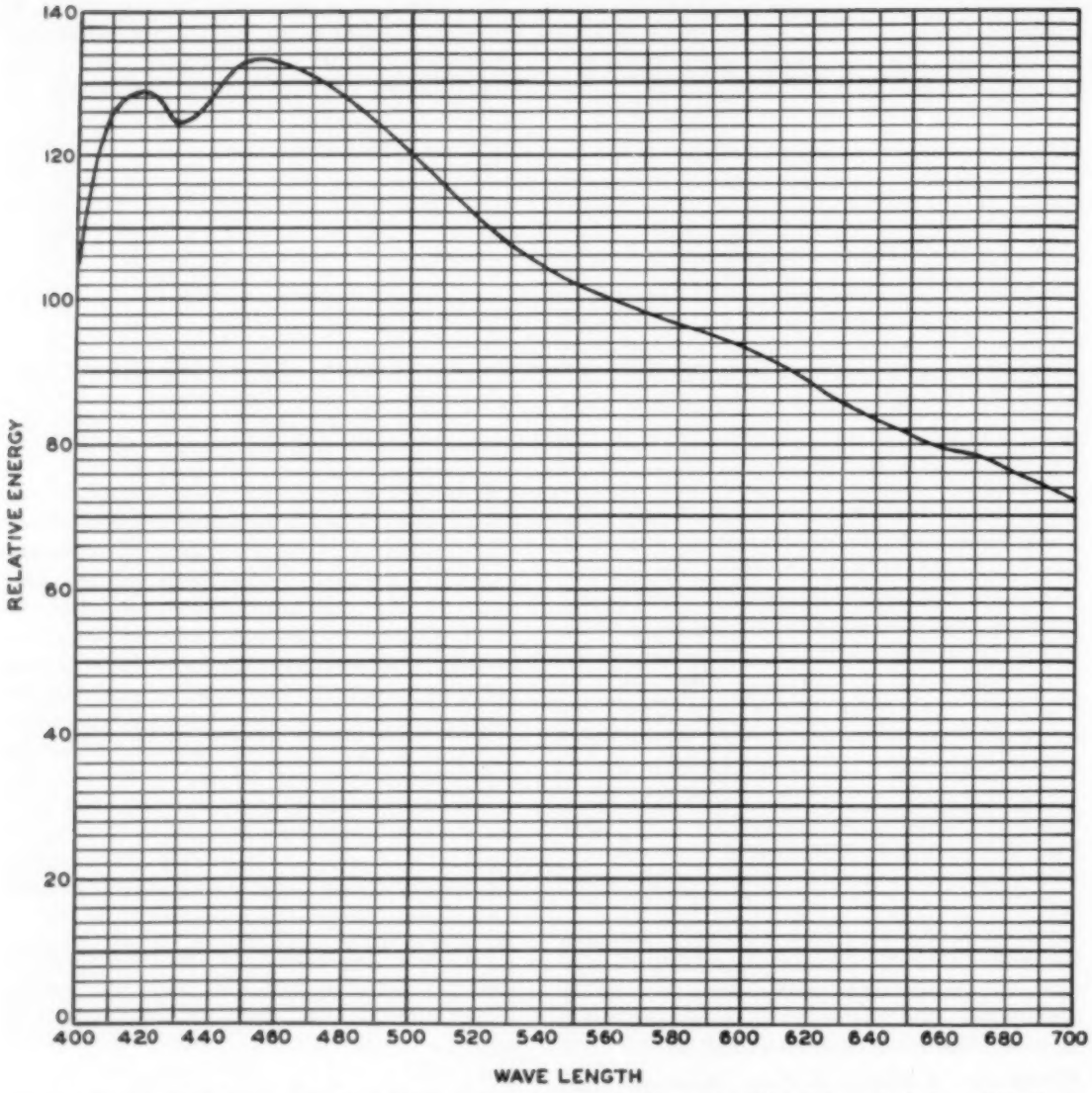

Figure 1. Spectral energy distribution data reduced to 100 at 560 mμ for Abbot-Gibson daylight at 7400K (135 mireds).

daylight at 7400K (Abbot-Gibson),* as shown in Fig. 1 (spectral curve) and in Table I. The Primary Standard Light Source should have a continuous spectrum with no emission lines and a correlated color temperature between 7100K and 7800K. It should have a "conformity index" of 130 or less as determined by the Equal Area 31 Band Method of Section 5.

2.3—*Illumination*— A minimum illumination of 100 footcandles at the plane of the sample or copy should be maintained. The illumination should not vary more than 20 per cent over the effective viewing surface, with 100 footcandles or more maintained at all points.

2.4—*Surroundings*— The conditions governing the surroundings for the Primary Standard Light Source for appraising "color quality" should be as shown in Fig. 2 and as follows:

(1) The area illuminated should be shielded from extraneous light.

(2) The color of the walls and backgrounds should be a medium neutral gray of approximately Munsell N7/ (43 per cent reflectance).

(3) The brightness of any reflecting areas in the field of vision should be no greater than four times that of the viewing surface.

*Abbot daylight (85 per cent) plus blue sky (15 per cent). (See references 4, 9 and 12.)

TABLE I — Relative Energy of Abbot-Gibson Daylight at 7400K, the Design Standard.

Wavelength (millimicrons)	Abbot-Gibson daylight at 7400K (relative energy)
400	104.7
10	125.5
20	128.4
30	124.2
40	128.0
450	132.6
60	132.1
70	130.8
80	128.1
90	124.0
500	120.2
10	115.9
20	111.4
30	107.2
40	104.1
550	102.0
60	100.0
70	98.1
80	96.7
90	95.5
600	93.9
10	91.1
20	88.4
30	85.8
40	83.8
650	81.6
60	79.8
70	78.1
80	76.6
90	74.5
700	72.1

(4) The position of the observer, light source, and copy or proofs should be such as to eliminate (or reduce to a minimum) direct glare from the light source and reflected glare from the copy or proofs.

3. Specific Recommended Requirements For Appraising "Color Uniformity"

3.1—*Terminology*—The light source for appraising "color uniformity" (Section 1.5) shall be designated as the Secondary Standard Light Source.

3.2—*Spectral Energy Distribution*—The design standard is daylight at 7400K (Abbot-Gibson)* as shown in Fig. 1 (spectral curve) and in Table I. The Secondary Standard Light Source should have a correlated color temperature between 7100K and 7800K. It should have a "conformity index" of 165 or less as determined by the Equal Area 31 Band Method of Section 5. If mercury lines are present, the lines in the visible spectrum should not have a combined energy greater than 15 per cent of the total light energy. If the Secondary Light Source is a combination of fluorescent and incandescent filament lighting, the resulting blend should be in a luminous ratio of no less than one lumen of incandescent light for each ten lumens of fluorescent light. When operated at rated voltage, such a combination should produce the desired correlated color temperature of 7400K.

*Abbot daylight (85 per cent) plus blue sky (15 per cent). (See references 4, 9 and 12.)

3.3—*Chromaticity*—Chromaticity tolerances for the Secondary Standard Light Source blend should be between $x = .29$ to $.307$ and $y = .300$ to $.325$.

3.4—*Illumination*—A minimum illumination of 100 footcandles from the Secondary Standard Light Source is recommended for the plane containing the samples or the copy. The illumination should not vary more than 20 per cent over the effective viewing surface, with 100 footcandles or more maintained at all points.

3.5—*Surroundings*—For optimum results from the use of the Secondary Standard Light Source for appraising "color uniformity," conditions governing the surroundings should be as specified in Section 2.4.

4. Specific Recommended Requirements For Color Matching of Basic Materials

4.1—*Terminology*—For color matching of basic materials, a Dual Light Standard is designated for the detection of metameric matches (Section 1.3). The dual lights are used separately when matching, and the color match should persist under both light sources.

4.2—*Spectral Energy Distribution*—One of the light sources should be the Primary Standard Light Source (Section 2.2). The second light source

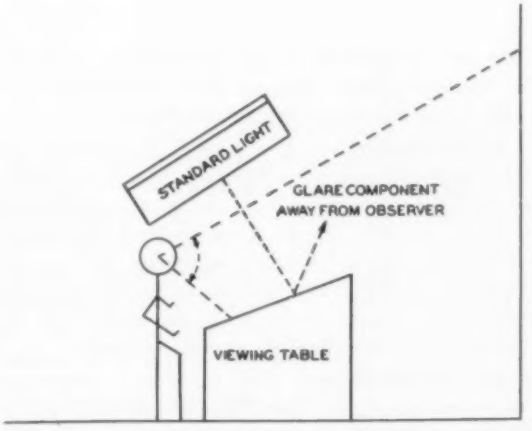

Figure 2. Surroundings. Area to be shielded from extraneous illumination, surround color neutral gray Munsell N7/ (43% reflectance) and:

1. **Brightness ratio in visual field to be no more than a ratio of 4:1.**
2. **Lighting level to be 100 footcandles minimum with no variation at any point on effective surface of more than 20%.**
3. **Miscellaneous:**
   a. **Operate lamps at rated voltage**
   b. **Follow relamping schedule**
   c. **Clean lighting equipment, as needed, to maintain standard.**

TABLE A. — Determination for Conformance of a Test Primary Light Source to the Design Standard, Which is Daylight at 7400K (Abbot-Gibson).*

(1) Wavelength (millimicrons)	(2) Design Standard: Abbot-Gibson Light at 7400K (relative energy)	(3) Test Primary Light Source at 7400K (relative energy)	(4) Adjusted Light Source (Col. 3 Times Constant K)** (relative energy)	(5) Difference between Design Standards & Adjusted Light Sources (Col. 2 Minus Col. 4) (relative energy)
400	104.7	81.8	92.5	+ 12.2
10	125.5	100.3	113.5	+ 12.0
20	128.4	109.6	124.0	+ 4.4
30	124.2	116.4	131.7	− 7.5
40	128.0	118.1	133.6	− 5.6
450	132.6	119.5	135.2	− 2.6
60	132.1	117.0	132.4	− .3
70	130.8	113.9	128.8	+ 2.0
80	128.1	109.7	124.1	+ 4.0
90	124.0	106.5	120.5	+ 3.5
500	120.2	104.6	118.3	+ 1.9
10	115.9	101.6	114.9	+ 1.0
20	111.4	96.9	109.6	+ 1.8
30	107.2	90.7	102.6	+ 4.6
40	104.1	88.0	99.6	+ 4.5
550	102.0	91.8	103.8	− 1.8
60	100.0	100.0	113.1	− 13.1
70	98.1	104.8	118.6	− 20.5
80	96.7	99.5	112.6	− 15.9
90	95.5	85.4	96.6	− 1.1
600	93.9	76.8	86.9	+ 7.0
10	91.1	76.2	86.2	+ 4.9
20	88.4	73.0	82.6	+ 5.8
30	85.8	68.2	77.2	+ 8.6
40	83.8	59.7	67.5	+ 16.3
650	81.6	56.7	64.1	+ 17.5
60	79.8	58.7	66.4	+ 13.4
70	78.1	67.5	76.4	+ 1.7
80	76.6	76.8	86.9	− 10.3
90	74.5	85.1	96.3	− 21.8
700	72.1	87.4	98.9	− 26.8
	3215.2	2842.2		Conformity Index +127.1 −127.3

*Abbot daylight (85 per cent) plus blue sky (15 per cent). (See references 4, 9 and 12.)

**Constant $K = \frac{3215.2}{2842.2} = 1.1312$

may have a spectral energy distribution as given by an incandescent filament lamp operating at a color temperature no higher than 2800K.

4.3—*Illumination*— A minimum illumination of 200 footcandles of the Primary Standard Light Source is recommended for the plane containing the samples or copy. The illumination from the second light source should be determined by the user to meet his specific requirements. The illumination from each source should not vary more than 20 per cent over the effective viewing surface.

4.4—*Surroundings*— The conditions governing the surroundings for the Primary Standard Light Source and the Secondary Standard Light Source for color matching are the same as for appraising "color quality" (Section 2.4).

5. Test Procedures

The procedure for using the Equal Area 31 Band Method for analyzing light sources applies only to test light sources having continuous spectral energy distribution. In the case of fluorescent sources, the method would apply only to the continuum, with the mercury spectrum lines being analyzed separately as a percentage of the total light energy as indicated in the specifications. The method is tentative with respect to fluorescent sources until such time as it is known what weighting should be given the mercury lines so that they may be included in the method itself. The method is as follows:

(1) Obtain spectroradiometric data for the test light source and its color temperature.

(2) Select Abbot-Gibson data for daylight at the same color temperature as the test light source and normalize at 100 on a relative energy scale at a wavelength of 560 millimicrons. (Relative energy data for Abbot-Gibson daylight at 7400K are given in Table I; for other combinations of Abbot-Gibson see references 9 and 12.)

(3) Determine the average value of each curve for each of the 31 bands at intervals of 10 millimicrons between 395 and 705 millimicrons.

(4) Divide the sum of the 31 values for the Abbot-Gibson data by the sum of those for the test light source, to obtain a Constant K.

(5) Multiply each of the 31 values for the test light source by constant K, then from the corresponding Abbot-Gibson value, algebraically subtract the value at each wavelength.

TABLE B. — Determination for Conformance of a Test Secondary Light Source to the Design Standard, Which is Daylight at 7400 K (Abbot-Gibson).*

(1) Wavelength (millimicrons)	(2) Design Standard: Abbot-Gibson Light at 7400 K (relative energy)	(3) Test Secondary Light Source at 7400 K (relative energy)	(4) Adjusted Light Source (Col. 3 Times Constant K)** (relative energy)	(5) Difference between Design Standards & Adjusted Light Sources (Col. 2 Minus Col. 4) (relative energy)
400	104.7	12.0	66.0	+ 38.7
10	125.5	14.8	81.4	+ 44.1
20	128.4	17.4	95.7	+ 32.7
30	124.2	19.6	107.8	+ 16.4
40	128.0	21.5	118.3	+ 9.7
450	132.6	23.1	127.1	+ 5.5
60	132.1	23.9	131.5	+ .6
70	130.8	24.5	134.8	− 4.0
80	128.1	24.4	134.2	− 6.1
90	124.0	23.7	130.4	− 6.4
500	120.2	22.5	123.8	− 3.6
10	115.9	21.4	117.8	− 1.9
20	111.4	21.4	117.8	− 6.4
30	107.2	21.0	115.5	− 8.3
40	104.1	20.6	113.3	− 9.2
550	102.0	19.9	108.5	− 7.5
60	100.0	19.6	107.8	− 7.8
70	98.1	19.6	107.8	− 9.7
80	96.7	19.3	106.2	− 9.5
90	95.5	19.1	105.1	− 9.6
600	93.9	18.9	104.0	− 10.1
10	91.1	18.6	102.3	− 11.2
20	88.4	18.3	100.7	− 12.3
30	85.8	17.8	97.9	− 12.1
40	83.8	17.4	95.7	− 11.9
650	81.6	16.1	88.6	− 7.0
60	79.8	15.4	84.7	− 4.9
70	78.1	14.5	79.8	− 1.7
80	76.6	13.6	74.8	+ 1.8
90	74.5	12.7***	69.9	+ 4.6
700	72.1	11.8***	64.9	+ 7.2
	3215.2	584.4	Conformity Index	+161.3 −161.2

Mercury lines (10 mμ band height above continuum)

405	10.4
435.8	30.0
546.1	17.0
578.0	5.0

*Abbot daylight (85 per cent) plus blue sky (15 per cent). (See references 4, 9 and 12.)

**Constant $K = \frac{3215.2}{584.4} = 5.5017$

***Extrapolated.

(6) Add the positive and the negative remainders separately. These should be equal to each other. The absolute value is the "conformity index."

An example of the procedure used in determining the conformance of a test primary light source to the design standard is shown as Table A in the Appendix; that of a test secondary light source is shown as Table B.

Appendix

(This Appendix is for informative purposes; it is not to be considered a part of "Lighting for the Color Appraisal of Reflection-Type Materials in Graphic Arts.")

Fluorescence

There is an increasing use of fluorescent materials in paper, inks, and other materials that may cause difficulties in the color matching of basic materials. The fluorescence of these materials may be activated by ultraviolet light or visible light, or both; therefore, caution is advised with respect to the color matching of basic materials that may fluoresce. In matching fluorescent materials it will be necessary to use a proper ultraviolet additive to the Primary Standard Light Source recommended for the matching of basic materials (Section 4). The exact specification of the ultraviolet additive is not known at this time, but it is being investigated and will be established by the Subcommittee on Problem 18 of the Inter-Society Color Council.

Color Transparency Illuminators

Where the original copy is a color transparency, a transparency illuminator conforming to ASA PH2.6 proposed standard should be used. Such an illuminator is intended to provide uniform brightness and to supply black body illumination at 3800 K within the tolerances specified.

The color of the transparency is affected by the transparency illuminator as well as by the immediate surrounding lighting. The absence of standardized lighting conditions has resulted in the viewing of color transparencies under extremely variable surrounding conditions. Standardized lighting

for viewing reflected copy (Sections 2 and 3) would at least remove the variable lighting conditions of the surroundings even though the transparency illuminator at a correlated color temperature of 3800K and the light source at 7400K are not the same. The differences between the color quality of the transparency illuminator and surrounding light source would be constant, and this is a step in the right direction. However, complete compatibility between the transparency illuminator and surrounding light source is desirable.

Inspection of Individual Colors By Increased Contrast

It is often desirable to inspect individual colors by increasing the contrast of the color on the printing stock so that the dot structure, for example, may be observed more readily. As in the case of process printing (using magenta, cyan, yellow, and black inks) it may be desirable to inspect one color at a time. For this type of inspection it is very helpful to increase the contrast of each color of ink by employing a complementary color light source. A saturated red light source for viewing the cyan ink, a saturated blue light source for viewing the yellow ink, and a saturated green light source for viewing the magenta ink would provide the increased contrast. The saturated blue is particularly helpful in the inspection of yellow ink on white stock. The three saturated light sources, blue, green and red (Fig. A), should have individual switching, and the conditions governing the surroundings should be generally the same as shown in Fig. 2 both as to lighting and as to geometry.

Applications of the Primary Standard Light Source (Section 2) and the Secondary Light Source (Section 3)

Some of the practical applications of the Primary Standard Light Source would be for master color proofing tables in the art and production departments of advertising agencies and for those used by platemakers, printers, and publishers.

Some of the applications of the Secondary Standard Light Source would be for tables used by platemakers and etchers for retouching, by platemakers for inspecting proofs, and by the pressmen for inspecting production press proofs.

The Dual Light Source (Section 4) would be applicable for use in ink rooms and ink laboratories.

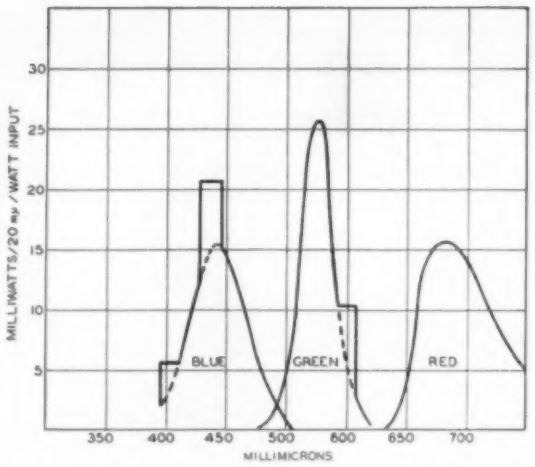

Figure A. Spectral energy distribution of colored fluorescent lamps with filters.

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A.I.A. File No. 31-f

INSTALLATION AT PETE'S BARBER SHOP, NORTHBROOK, ILL.

Lighting a Barber Shop

LIGHTING OBJECTIVE: To provide a high level of illumination for haircutting and other services rendered in a barber shop.

GENERAL INFORMATION: The shop, which has three barber chairs upholstered in light tan, is 15 feet by 26 feet and has a 9 foot 6 inch ceiling height. Colors and reflectances of the major room surfaces are: ceiling, white, 70% RF; walls, turquoise, 45% RF; floor, light tan, 30% RF.

INSTALLATION: Four Lighting Products, Inc. LUV-R-LOK catalog No. 174RWF 4-40 louvered luminaires, each equipped with four 40-watt standard cool white fluorescent lamps, are suspended eight feet above the floor and are spaced on six-foot centers — approximately three feet on each side of each barber chair. The average level of illumination 600 hours after installation was 30 footcandles. The average level of illumination at customer's head locations was 100 footcandles.

Brightnesses at the time of illumination readings were as follows:

luminaire	crosswise at 45°	940 ft-L	floor	12 ft-L
	lengthwise at 45°	550 ft-L	cloth about customer's neck	60 ft-L
walls		15 ft-L		

Lighting designed by Mason & Basedow, 6733 N. Olmsted Ave., Chicago 31, Ill.; Contractors: North Suburban Electric Co., 103 Waukegan Rd., Northbrook, Ill.

Lighting data submitted by Don Davis and M. McCreight, Lighting Products Inc., Highland Park, Ill., as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Series XXII 9-57

A.I.A. File No. 31-f

LIGHTING NEWS

Grand Rapids Was Site for Great Lakes Regional Conference

Younger Sections usually approach so major a project as a Regional Conference with some misgivings. This year's experience for several of them should dispel all doubts. To wit: Victoria, B. C., Albuquerque, and now Grand Rapids. The Great Lakes Regional Conference held there May 13 and 14 was, if anything, better than ever. Final attendance was in excess of 250 people, the program was exceptionally worthwhile, and was presented on time and without any technical difficulties. Western Michigan Section was the successful host.

PROGRAM

Every moment counted, at this conference, including the Sunday evening prior to the opening session. Registration was open to early-birds, but in addition, a Regional Vice-President's meeting was in full session all Sunday evening.

Following the Invocation by the Reverend Robert B. Martin, conference delegates were welcomed by Kenneth Rypstra, Assistant City Manager of Grand Rapids. He facetiously pointed out that the conference had to be delayed until the City had replaced the antique business district lights with the new fluorescent units which are now gracing downtown Grand Rapids.

MMILJ was the first item on the program — so complete it took all morning. Ten entries. Every Section in the Region, except one. Highly organized, with a briefing-breakfast-meeting for entries befor the meeting, specially appointed slide coordinators, judges' secretaries to assist in that phase, and official timers during the contest. All this paid off with an exceptionally interesting contest. Results were:

Class I — Residential

FIRST: George Matilo, Cleveland Section. "Lighting Design for the Operation, Demonstration House."

SECOND: Mrs. Gertrude Urbank, Michigan Section. "A Decorator Uses Light as a Tool for Decoration."

Class II — Commercial

FIRST: Lawrence T. Genise, Michigan Section. "Lighting the Exhibition Pool, University of Michigan."

SECOND: David L. Bostwick, Cleveland Section. "Lighting Design for the First Methodist Church in Niles, Ohio."

THIRD: James Q. Miller, Western Michigan Section. "Relighting of St. Paul's Episcopal Church Guild Hall, Muskegon, Michigan."

Runners-up, all excellent jobs, were:

George R. Butler, Rochester Section. "Lighting a Small Workshop."

Vincent J. Moore, Central New York Section. "Attraction and Atmosphere in a Properly Lighted Large Restaurant."

F. Brendon Burke, Western New York Section. 'Lighting a Drafting and Engineering Room."

Harold J. Gruber, Ohio Valley Section. "You Can Bank on It."

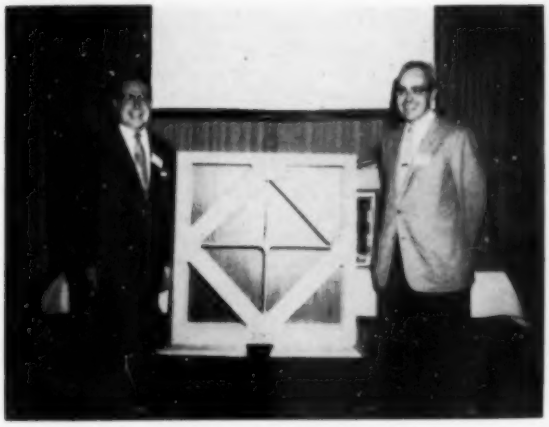
Dave Kirby, Northwestern Ohio Section. "Relighting a Multipurpose Room in the American Legion Post."

Judges for the contest were: for Class I, Al Paulus, Westinghouse Electric Corp., Chairman, Fred Guth, Edwin F. Guth Co., and Charles L. Amick, Day-Brite Lighting Inc. For Class II: Mar-

REGISTERING two of the some 250 people at the Great Lakes Regional Conference, Pantlind Hotel, Grand Rapids, Michigan is (right) Harold P. Early, with delegates William F. Harper and Ronald C. Lyon.

MMILJ WINNERS. Standing, l. to r.: L. T. Genise, George F. Matilo, Mrs. Gertrude L. Urbank, James Q. Miller and Donald L. Bostwick. There were a total of ten entries in the contest — first prize winners in all but one of the Sections and Chapters of the Region.

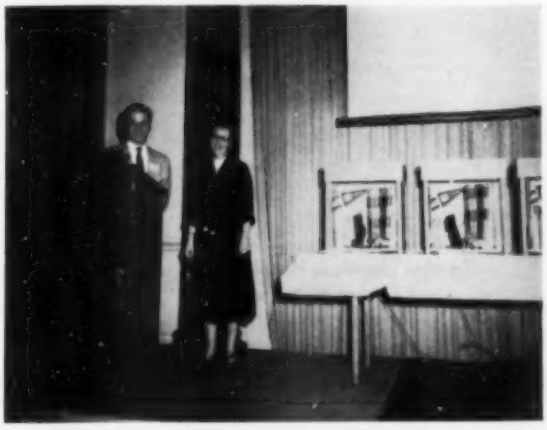
SPEAKERS at the Great Lakes Regional



Richard M. Smart, Donald J. Theisen.

M. C. Keck, session chairman, with speaker Dr. H. Richard Blackwell.

Carl J. Allen, left, with Lloyd Cartwright.



Session chairman Byron F. Lyth, Jr. and Miss Mary B. Taepke.

shall Waterman, I.E.S. President, Chairman, Robert Hartenstein, Ohio Edison Company, and Nelson Warner, East Central V-P. Judges' Secretaries, William Laur and John S. Stewart. Timers, Hugh Dutter and Howard Waite. Slide Coordinators, H. F. Brandt and Roy McGuire. Breakfast Details, Ray Lawkowski.

The afternoon sessions got off to a good start with an excellent presentation of "Lighting for the Visually Handicapped" by Dr. H. Richard Blackwell of the University of Michigan. Dr. Blackwell, who is active also in major researches for the Illuminating Engineering Research Institute, presented several new and basic theories on sight. He reported that some of the theories have been proved by experimentation and that further experiments are underway to fill additional gaps in the lighting knowledge.

For the session on Residential Lighting that same afternoon, Mary Taepke of Detroit Edison pinch-hit on short notice for the billed speaker, Jan Reynolds of Sylvania who was felled by illness. Miss Taepke did a wonderful job of presenting the program, using slides and equipment already sent to the conference by Miss Reynolds.

Another hitch to the afternoon session was averted when Richard Smart of Sylvania Electric Products Inc. presented his "New Trends in Store and Shopping Center Lighting," as a replacement for the scheduled lecture by Stacy Standley. Mr. Standley was grounded by fog in Milwaukee, but, to the advantage of those present, spoke Tuesday morning instead.

The pace continued the following day, and included as well, a Men's Luncheon with President Marshall N. Waterman the speaker.

Social Events

While the men were engaged in the serious business of a conference, the ladies enjoyed some of the sights of Michigan's Water Wonderland. On Monday they toured the multi-store Furniture Exhibition Building, after a luncheon at the Women's City Club, complete with favors and door prizes. On Tuesday, they left early in the morning by chartered bus to see the tulip festival at Holland, Michigan — a world-renowned display, at its peak during conference week.

Biggest event of all was, of course, the gala reception and banquet held in honor of President and Mrs. Waterman, Monday evening, May 13. Picking up the Holland motif, the displays and decoration committee (ever a good team in the Great Lakes Region) featured an elaborate Dutch windmill. President and

Mrs. Waterman were presented with a beautiful Sligh "High-Lo" combination cocktail and dinette table, which was felt to be an appropriate gift to remind them of the Furniture Capital of the World. Winners of the MMILJ contest received their awards at the banquet — after which, dancing till one.

EVENTS

Time: May 13-14, 1957
Place: Pantlind Hotel,
Grand Rapids, Michigan

Monday Morning, May 13

Invocation — Rev. Robert B. Martin.
Welcome Address — by Kenneth Rypstra, Assistant City Manager.
My Most Interesting Lighting Job Contest — Earl R. Domoney, Chairman.

Monday Afternoon

Chairman, M. E. Keck, Cleveland Section
Co-Chairman, Byron F. Lyth, Jr.,
Western New York Section

"Lighting for the Visually Handicapped," by Dr. H. Richard Blackwell, University of Michigan, Ann Arbor, Mich.
"School Lighting for Audio-Visual Teaching," by Carl Allen, General Electric Co., Nela Park, Cleveland, Ohio.
"Residential Lighting"—Mary E. Taepke, Detroit Edison Co., substitute for Jan Reynolds, Sylvania Electric Products Inc., New York, N. Y.
"New Trends in Store and Shopping Center Lighting," by Richard Smart, Sylvania Electric Products Inc., Cleveland, Ohio.
Evening—Cocktail Party and President's Reception and Banquet.

Tuesday Morning, May 14

Chairman, Harry B. Robbins,
Michigan Section

Co-Chairman, Robert Colgan,
Northwestern Ohio Section

"Trends in Street Lighting," by Stacy Standley, Line Material Co.
"Plastics in Lighting," by H. A. Williams, Rohm & Haas Co.
"Trends in Industrial Mercury Vapor Lighting," by Al Paulus, Westinghouse Electric Corp.
Men's Luncheon. Speaker, President Marshall N. Waterman.

Tuesday Afternoon

Chairman, R. Bruce Thompson,
Rochester Section

Progress Report, by J. H. McCulloch, Independent Testing Laboratory.
Lighting Forum — Lee E. Tayler, Coordinator of panel of prominent Lighting engineers. Audience participation, questions and answers.

Committees

The following committee chairmen were the successful directors of the Great Lakes Regional Conference:

Conference Executive Committee
R. M. Taylor, Regional Vice-President
Arthur B. L. Slenker, Regional Conference Chairman
L. G. Thompson, Vice-Chairman
William Harper, Finance
William Winglar, Secretary

Operating Committees
Attendance and Publicity, Eugene Gonya
Registration, Harold P. Earley
Ladies, Mrs. William Harper
Hotel, Otto Heinrich
Lighting Display and Decoration, Dale Crites
Entertainment, Robert Graham
Papers and Program, Ron Lyon
Transportation, Max Beiner

Regional Officers
Robert Colgan, Chairman, Northwestern Ohio Section
V. G. McClusky, Chairman, Ohio Valley Section
R. Bruce Thompson, Chairman, Rochester Section.
Byron F. Lyth, Jr., Chairman, Western New York Section
Edwin L. Moyer, Chairman, Central New York Section
Merle E. Keck, Chairman, Cleveland Section
D. R. Hughes, Jr., Chairman, Miami Valley Section
Harry R. Robbins, Chairman, Michigan Section
W. Dale Crites, Chairman, Western Michigan Section.

Ten New Fellows Elected

Acting on the recommendation of the Board of Fellows, Council unanimously elected to Fellow Grade ten distinguished members of I.E.S. This action, taken at the June meeting of Council, elects the following Fellows:

George A. Freeman, Manager of Incandescent and Vapor Lamp Engineering, Westinghouse Electric Corp., Bloomfield, N. J. Mr. Freeman's technical contributions, particularly in the development of mercury and short-arc lamps are well known. Several of his studies in these fields have been published in I.E. and in the electrical press. During the course of 23 years in the lighting field, Mr. Freeman has been engaged in lamp development of the coiled-coil filament for incandescent lamps; early developments of mercury lamps in hard glass bulbs; initial and continuing development of mercury lamps in quartz; sunlamps, photoflash and airport approach sources, as well as notable work in methods of measurement and standardization. He holds some 19 patents for his inventions, all pertaining to illuminating engineering. Mr. Freeman is currently Vice-Chairman of the I.E.S. Committee on Light Sources.

J. S. Hamel, Consulting Engineer, Glendale, Calif. One of the country's most eminent consulting engineers, Mr. Hamel's most recent work includes "Disneyland," for which he was consultant to Walt Disney. A vast project, now world-renowned, this installation includes the most extensive blacklighting jobs ever undertaken. Throughout the 25 years of his career, Mr. Hamel has been a leader in the development of illumination design for indoor and outdoor theatrical lighting. In 1935 he developed the first large-scale outdoor theater at Jones Beach, Long Island. He was also a consultant to the New York World's Fair on illumination, designing and developing spectacular lighting. Mr. Hamel developed the use of Fresnel lens for downlighting, and is the inventor of "Colouvering" process for control of glare from Fresnel lens downlights for general lighting. Currently he is active in the development of an integrated system of ceiling suspension lighting, acoustics and air-conditioning.

Charles W. Jerome, Senior Engineer, Lighting Division, Engineering Laboratories, Sylvania Electric Products Inc., Salem, Mass. As a frequent author of basic technical papers, Mr. Jerome's name is well-known to readers of I.E. For the past ten years, Mr. Jerome has been a working member of a research team on several research problems, connected primarily with fluorescent lamps. His original work on this subject has appeared in such papers as The Determination of Color Parameters of Fluorescent Lamps, Electroluminescence—A New Method of Producing Light, published in 1950; Specification of Color Rendering

Next Year's Conference Papers

Deadline for outlines of next year's conference papers will be December 31, 1957. The earlier date of the conference next year (August 17-22, 1958) has necessitated an earlier deadline for Papers Committee consideration of proposed papers. Those wishing to present papers before the 1958 conference in Toronto should submit outlines of them, not later than December 31, 1957, to:

Mr. H. F. Davidson, Chairman, Papers Committee
Curtis Lighting of Canada, Ltd.
195 Wicksteed Ave.
Leaside, Toronto 17, Ont.

New Fellows

George A. Freeman

J. S. Hamel

J. Roy Jones

Charles W. Jerome

William W. Lozier

James H. McCulloch

Alston Rodgers

Dana W. Rowten

Theodore H. Shepherd

Ray P. Teele

Properties of Fluorescent Lamps (with D. B. Judd) and works on the effect of temperature on fluorescent lamps, problems involved in their design and numerous others. Mr. Jerome is, of course, also active with I.E.S. Currently he is a member of the Papers Committee, and of the subcommittee on Color Rendition of Light Sources.

J. Roy Jones, Region Engineer, Westinghouse Electric Corp., Los Angeles, Calif. Mr. Jones' work as co-originator (with J. J. Neidhart) of the Zonal Method of computing coefficients of utilization and illumination is felt by many in this industry to be one of the major advances in illuminating engineering. Published in 1953, Mr. Jones' work on the Zonal Method followed other important studies, notably on the coefficients of utilization for luminaires and other basic papers. Published since 1953 are two major papers presented before the National Technical Conference of I.E. S.: "A Comparison of Measured and Calculated Coefficients of Utilization" and "Algebraic Interflectance Computations," both jointly with J. J. Neidhart. Mr. Jones' talents as an illuminating engineer have been of immense value also to numerous I.E.S. technical committees. He has served particularly with the Lighting Design Practice Committee, as chairman and currently as a member, with the Store Lighting Committee continuously for some five years, as a member of the Lighting for Public Buildings Committee, and official representative on the ASA subcommittee Z-17. A speaker in great demand for major I.E.S. meetings, Mr. Jones has proved a successful program planner as well. The outstandingly valuable programs presented at the South Pacific Coast Regional Conferences, in 1955 and again in 1957, were developed by Mr. Jones as Program and Papers Chairman.

William Wallace Lozier, Research on Light Sources, National Carbon Research Laboratories. Mr. Lozier's outstanding contributions, particularly in the field of searchlight projection and motion picture photography, have brought him recognition and honor from other technical societies as well as I.E.S. Mr. Lozier is a Fellow also of the Society of Motion Picture and Television Engineers, of the American Physical Society and is a National Research Fellow. He is the author of numerous papers on subjects related to motion pictures and is noted for his development work for motion picture projection systems, illumination for motion picture photography, illumination for graphic arts processes, and searchlight projection. Mr. Lozier holds two patents on carbon arc electrodes. In his valuable work for I.E.S., Mr. Lozier is currently serving with the Searchlight Committee and the Light Sources Committee.

James H. McCulloch, Independent Testing Laboratories, Boulder, Colo. Mr. McCulloch's influence in illuminating engineering has been felt in many areas — from stage lighting to ballasts — and as teacher, development engineer, and photometrist. Mr. McCulloch's successful operation of his own testing laboratories and his coast-to-coast series of lighting demonstrations as Chairman of the Progress Committee are spreading still further his renown as a prominent figure in illuminating engineering. He has for many years been a leading lecturer on illumination, again on a wide variety of its phases, before many I.E.S. Regional Conferences, and is the author of numerous papers, both in I.E. and the trade

press. In addition to his widely-known work as Chairman of the Progress Committee, Mr. McCulloch is a member also of the Theatre Lighting Subcommittee, the subcommittee on Brightness Measurements of the Testing Procedures Committee, and the Institutional Committee. Prior to establishing his photometric testing laboratory in Boulder, Mr. McCulloch was associated with the Ballast Division of General Electric, with the Sunbeam Lighting Company in California, and with Stanford University, where he was a teacher in stage lighting.

Alston Rodgers, In Charge of Design Group, General Electric Institute, Nela Park, Cleveland, Ohio. Mr. Rodgers has worked in many capacities for the Illuminating Engineering Society, and for the science of illuminating engineering in general. Perhaps he is best known recently for his work as Chairman of the Committee on Progress, during which he toured the country with his highly educational lecture and demonstration on lighting developments. He has, however, been a well-known contributor to illumination for some 25 years. His first paper presented before the Society's National Technical Conference was at the Lake Delevan Convention in 1933. In 1938, he was a member and a leading factor of the committee which prepared the American Standard Practice of School Lighting, a field in which he has made numerous other valuable contributions. He is known equally well for his development work in store lighting, stage lighting and office lighting. For some years he was in charge of the Nela Park school lighting activities, and traveled throughout the country delivering talks on lighting subjects. During World War II, as a Naval Reserve Officer, Lt. Commander Rodgers served for three years in the Special Devices Division of the Navy's Office of Research and Inventions, where he developed many unusual devices for training aviation and submarine personnel. He was in charge of the development of the remarkably effective submarine simulator trainer at New London. Lighting played an important part of the subject. Mr. Rodgers brought not only a thorough knowledge of general lighting and many specialized lighting applications to his U. S. Navy assignments, but basic seeing fundamentals as well. Prior to the war, he was District Engineer for the General Electric South Pacific District at Los Angeles, and for two years he also headed his company's engineering services on lighting in the Hollywood motion picture studios. Mr. Rodgers now heads the Design Group of the G-E Lighting Institute. This group is responsible for planning the physical facilities used for lighting training purposes, and in planning lecture outlines.

Dana W. Rowten, Manager Lighting Application Section, Westinghouse Electric Corp., Cleveland, Ohio. One of the country's foremost street lighting engineers, Mr. Rowten is also a leading name in the entire outdoor lighting field. Currently chairman of the I.E.S. Committee on Street and Highway Lighting, and a member of the Testing Procedures Committee, and Protective Lighting Committee, he has been chairman also of the Sports and Recreational Lighting Committee, and a member and/or chairman of many other technical committees. Much of his work, particularly in street lighting, has been presented before the National Technical Conference, and appears in the literature, both I.E. and the trade press. Especially noted is his work in development of mercury vapor street-lighting techniques; and his studies of the economics of mercury lighting for industrial areas. Mr. Rowten's original work and theories have resulted in many standard practices and improvements in lighting equipment and application techniques. He is credited with conceiving and installing the first soft-ball lighting system in 1926, which was the forerunner of the development of the NEMA lighting plans and later the I.E.S. Sports Lighting Practices. As far back as 1927, Mr. Rowten conceived, designed and installed the original hinged floodlighting poles for service station floodlighting. This work has been followed by numerous "firsts" in the outdoor lighting field, both in design, and application. He is a pioneer also in experiments and developments in operating the fluorescent lamp at very low temperatures. His work in this field has resulted in the development of a fluorescent lighting system which will operate successfully at temperatures as low as 30 degrees below zero in cold storage areas and similar applications.

Theodore H. Shepherd, Supervisor in charge of Illumination and Engineering, Los Angeles Department of Water and Power. As a consultant on lighting problems, as an educator and lecturer on illumination, and as designer and engineer for numerous lighting installations, Mr. Shepherd has been a well-known figure for some 30 years. Some of the major installations with which he has been connected include the Los Angeles Coliseum, Wrigley Field, Rose Bowl, and the Los Angeles International Airport, to name only a few. He is especially renowned for his work during World War II as West Coast Defense Lighting coordinator. In this capacity he worked directly with the Armed Forces on the West Coast, to establish the provisions for the dimout and blackout. His work included both technical research and investigations, and operational procedures. In this connection also, he was in much demand as a consultant in the Los Angeles area on dimout procedures and was called upon to advise the general public, as well as individuals and law-enforcement agencies, on shielding methods to comply with dimout restrictions. Mr. Shepherd has a citation from the Office of Civil Defense, commending him on work done during the blackout and dimout.

Ray P. Teele, Physicist, Photometry and Colorimetry Section, National Bureau of Standards, Mr. Teele has been prominent for some 30 years in the fields of photometry, testing procedures, colorimetry, lighting maintenance, lighting for defense, and motor vehicle and highway lighting. A past chairman of the Capital Section, he has served as chairman also of numerous technical committees including: Testing Procedures, Illumination Performance Recommendations, Maintenance, Conillum, Street and Highway, Motor Vehicle, Progress Committee, as well as numerous subcommittees and national Standing and General Committees. His practical approach to illuminating engineering is reflected in many well-known installations; notably, the National Red Cross Building, lighting for the Government offices, protective lighting for historic documents, the display cases and the National Archives, and many others. He holds several patents on lighting devices; including a headlight mask for blacked-out automobiles, headlamp for motor vehicles, and improved navigational lights. An active member of the U. S. National Committee, C.I.E., Mr. Teele is also a United Representative on the C.I.E. Technical Committee for Photopic and Scotopic Vision.

Gold Medal Nominations Due by January 1

Nominations of candidates for the 1958 Gold Medal Award are being sought by the Medal Award Committee, for consideration for next year's award. Such nominations must be received at Society headquarters by January 1, 1958.

The I.E.S. Medal, highest honor in illumination is "for meritorious achievement which has conspicuously furthered the profession, art or knowledge of illuminating engineering."

Candidates for the award need not be members of the Society, nor citizens of the United States or Canada. Candidates may be nominated at any time by any member of the Society, by sending to the

(*Continued on page* 17A)

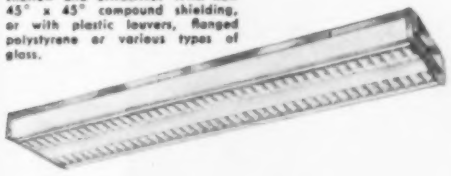
. . . the man from Smithcraft

*George Kolbe, manager of Smithcraft's New York City team of Kolbe, Goren and Smith . . . part of the nationwide Smithcraft sales organization.

. . . 4 good NEW ideas in lighting

CIVIC—an architectural form . . . shallow, good-looking and in excellent taste. An extruded aluminum-framed unit.

TWOSOME — Top value, low cost, shallow and attractive. With new 45° x 45° compound shielding, or with plastic louvers, flanged polystyrene or various types of glass.



EXECUTIVE — an all-steel louvered unit; shallow with illuminated, tapered sides. Provides 30° x 45° shielding.

FREEWAY—Modern, architectural corridor-lighting . . . Totally enclosed. Clean, simple plastic shielding.

In addition to the CIVIC and the TWOSOME, Smithcraft's new developments include the EXECUTIVE and the FREEWAY. You'll find all four units useful to you in the planning of lighting for today's interiors.

He's the man whose experience and knowledge of lighting is backed by Smithcraft's highly diversified line of fluorescent lighting units. The "Man from Smithcraft" can suggest the new *CIVIC*, for example, for interiors requiring the very finest in "prestige lighting". Or he can turn to the brand new top value *TWOSOME* for general office, store or school lighting. Ask the man from Smithcraft to show you Smithcraft's "4 GOOD NEW IDEAS IN LIGHTING".

Wherever good lighting is important, you'll find . . .

Smithcraft — "AMERICA'S FINEST FLUORESCENT LIGHTING"
CHELSEA 50, MASSACHUSETTS

PLEASE ATTACH TO YOUR BUSINESS LETTERHEAD and mail to

Smithcraft LIGHTING, CHELSEA 50, MASS.

IE-9

NAME _____

TITLE _____ CO. _____

ADDRESS _____ CITY _____ STATE _____

☐ Please send me the monthly publication, "Light Side of the News", so that I can keep in touch with the latest trends in lighting.

☐ Please send me folders and catalog sheets on the "4 Good New Ideas in Lighting"

☐ Please send me the complete SMITHCRAFT CATALOG, containing data on America's Finest Fluorescent Equipment.

1. GENERAL OFFICE AREA in a new administration building makes extensive use of panels of Pattern No. 70 with luminous element. Illumination is glare-free and pleasing to the eye.

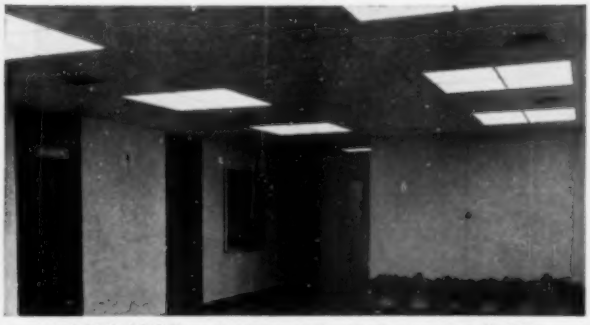
Only you would

2. LABORATORY gets the kind of low surface brightness required for close work with these suspended troffers. Main panels are Pattern No. 70; sides of Alba-Lite provide excellent diffusion. Suspended troffers also permit fitting lighting fixtures around needed venting apparatus.

3. CONFERENCE ROOM in recently erected building to house an advertising agency uses PYREX® lenslites mounted in free-form wood unit of custom design and fabrication.

4. FLUSH troffers using Pattern No. 70 bathe secretarial work area in soft, glare-free light. Ceiling mounts like this add to neat looks of office, minimize maintenance and cleaning problems.

5. FOTA-LITE provides subdued but highly efficient illumination for a top executive's office. This glass combines the advantages of smooth sheet glass with the control afforded by louvers.



6. GOOD LOOKS and adequate illumination are provided by these Square Alba-Lite Bowls mounted flush in lobby ceiling. Diffusing property of this glass obscures fluorescent elements.

7. END-TO-END troffers attached to ceiling have main panels of Pattern No. 70 with Alba-Lite side elements. This arrangement provides optimum light and service conditions for new office in a large printing establishment.

look UP in any of these 7 settings!

What's the best test of the effectiveness of any lighting system?

Quite probably it's the number of people who don't look up. The reason is simple: *When illumination is adequate, pleasant, unobtrusive, there's little reason to examine its source.*

Except, of course, from your standpoint.

And for *you* Corning makes the kind of lightingware that provides the *control* you need to achieve the *effects* you want.

From the situations pictured, you can get an idea of the variety of lighting problems that can be effectively handled with Corning glassware.

Extra value

You'll also find a number of important *bonus* values in lightingware by Corning. It looks good. It comes in many shapes and forms to fit into (*even add to*) every kind of décor and setting.

And your customers get the added advantages of lighting that's readily serviced, easy to keep clean and new-looking, rugged, and long-lasting.

Still more

Corning also makes special lightingware for use in maximum security situations and environments involving adverse conditions like wide temperature fluctuations.

At your fingertips

All the important details of what's available from Corning are summed up in "Commercial Lighting Application Guide." In it you'll find data on types of fixtures, varieties of glassware, suggested applications, in-use photos, and estimating tables. Free with the coupon.

Inquiries about specific problems, glasses and availabilities will receive prompt replies.

CORNING GLASS WORKS
61-9 Crystal Street, Corning, New York

Please send me a copy of "Commercial Lighting Application Guide."

Name.....Title.....

Company.....

Street.....

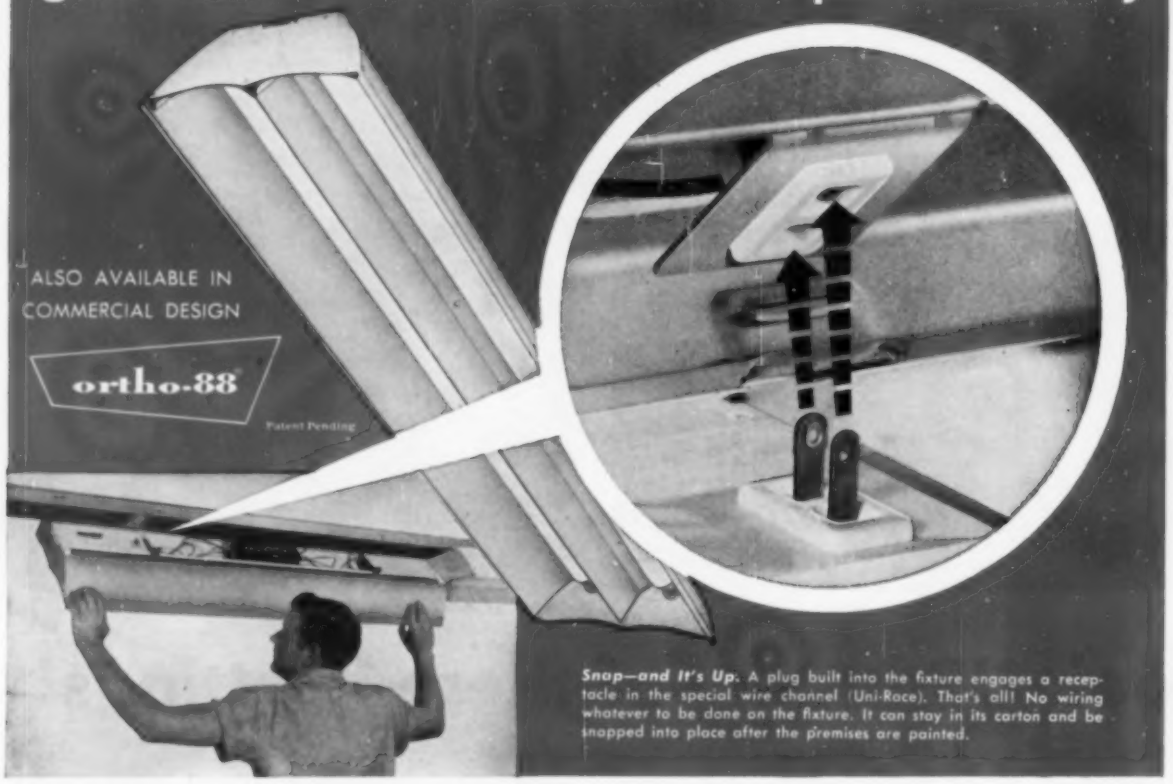
City.....Zone.....State.....

Corning means research in Glass

CORNING GLASS WORKS, 61-9 Crystal Street, Corning, N.Y.

THE FIXTURE THAT JUST PLUGS IN

gives lowest-cost installation... unequaled flexibility



Snap—and It's Up. A plug built into the fixture engages a receptacle in the special wire channel (Uni-Race). That's all! No wiring whatever to be done on the fixture. It can stay in its carton and be snapped into place after the premises are painted.

Because the Gibson Ortho eliminates so many of the time-taking operations common to conventional installations, it easily saves more than 50 percent in installation costs. Many contractors report that all labor, including branch circuit wiring, stems and lamping, averages only 17 to 22 man-minutes per fixture. Complete flexibility is another reason for this unique fixture's growing popularity. The Ortho can be mounted in continuous rows or at intervals of 4, 8, 12 or more feet, and re-spaced at any time without tools.

There's a lot more you should know about this remarkable fixture. Won't you let us send you complete descriptive literature? Drop us a line today.

3 SIMPLE STEPS TO INSTALL THE ORTHO

1 Telescoping sections of Uni-Race assembled and wired on the floor.

2 Light but rigid Uni-Race assembly, up to 24', easily lifted and hung.

3 Fixtures snap into place in seconds without tools. No wired connections.

Patent Pending

Gibson LIGHTING

GIBSON Manufacturing Co.

1919 Piedmont Circle, N.E., Atlanta 9, Georgia

MAKERS OF THE NEW Ceilo•35 WORLD'S THINNEST FIXTURE WITH NO DARK AREAS

IN CANADA manufactured under franchise by one of Canada's oldest and largest manufacturers of lighting fixtures **ELECTROLIER MFG. CO. Ltd., Montreal**

(Continued from page 12A)

General Secretary at Society Headquarters the name of the individual whose accomplishments may be in the field of engineering, design, applied illumination, optics, ophthalmology, lighting research, education, or administration and management.

In order for a candidate to be considered for the award in any given year, a letter requesting consideration of the proposed candidate must be delivered at the Society's headquarters office (1860 Broadway, New York 23, N. Y.) before January 1 of that year.

I—The Growth of Allied Arts

For the past several years, Allied Arts committees in Sections and Chapters have been organizing and conducting university student contests in which lighting is featured. The Committee's work has been centered primarily on architectural colleges with three-way collaborations including art, industrial design, and engineering groups as their ultimate goal. Not all Sections and Chapters have within their geographical limits all the types of colleges mentioned, but a large number do have architectural and art schools especially in the east and middle west and far west. The Committee's prime object is the spread of knowledge of the art and science of illumination as part of the curriculum of building-design courses.

For the past twenty years and more, our Society has increasingly recognized the importance electric-lighting systems have as a part of the basic structure of buildings. As expressed by Cornell's Dean of Architecture, Thomas W. MacKesey *(Building)* *"form is a function of light."*

The *architect* is the person most concerned in this trend. He is the one who must finally correlate all building features, integrating each into a satisfactory whole. (He should not promote the phrase "lighting by owner" . . . any more.) He should see in a better form of lighting not only a way to help to get more for his client's dollar, but also a method of postponing obsolescence.

The *interior (or industrial) designer* has a growing part in better buildings. He can supply features which lend artistic interest and lasting beauty in sculptural forms and in the choice of colorants, fabrics, and furniture to make the interiors both modern and pleasing places in which to work or live. Here again light casts its glow on all architectural elements, both inside and outside. "A building architectonically fit is one that's properly lit."

The *electrical engineer* has an inherent concern in the functioning of many services that electricity provides. But, as expressed by M.I.T.'s Dean of Humanities, John Ely Burchard, "The goal of the ideal (college) program is to develop the capacity of the technician to undertake responsibility for the forms that his technical training creates." Some of the forms are air-conditioning, heating, vertical transportation, and communication, all of which depend in increasing measure on light and lighting.

Many corporations are paying increasing attention to the idea that besides utility, it pays to pay for beauty as well. In commercial buildings this trend is especially marked, but in industrial buildings it is a matter also of growing concern. In the production of goods, one writer wrote that "a certain amount of light, generally electric, goes into each product." This thought might be extended to express that every theater ticket buys a quantity of light, every purchase in a store, also, and every book in school requires a vast quantity of light before its owner is through with it. Lighting is a building form.

However, in many currently-used text-

(Continued on page 18A)

SCHEDULED EVENTS

September 9-13, 1957 — Illuminating Engineering Society, National Technical Conference, Biltmore Hotel, Atlanta, Ga.

September 13, 1957 — Council Meeting, I.E.S., Biltmore Hotel, Atlanta, Ga.

September 24-26, 1957 — Institute of Traffic Engineers, Statler Hotel, Detroit, Mich.

October 4-9, 1957 — Society of Motion Picture and Television Engineers, Hotel Sheraton, Philadelphia, Pa.

October 5-8, 1957 — International Association of Electrical Leagues, Sinton Hotel, Cincinnati, Ohio.

October 7-9, 1957 — National Electronics Conference, Inc., Hotel Sherman, Chicago, Ill.

October 10, 1957 — Annual Meeting, I.E.S., Society Headquarters, New York, N. Y.

October 7-11, 1957 — American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

October 8-10, 1957 — Electrical Progress Show, Convention Hall, Philadelphia, Pa.

October 9-11, 1957 — Canadian Electrical Manufacturers Association, Sheraton-Brock Hotel, Niagara Falls, Ont.

October 17, 1957 — Society of Plastics Engineers, Regional Technical Conference on "Polyethylenes," Hotel Carter, Cleveland, Ohio.

October 18-19, 1957 — Professional Engineers of Oregon, Eugene Hotel, Eugene, Ore.

October 21-25, 1957 — National Safety Council, 45th National Safety Congress & Exposition, Chicago, Ill.

October 26-31, 1957 — National Association of Electrical Distributors, (Semiannual Meeting), Edgewater Beach Hotel, Chicago, Ill.

October 27-30, 1957 — National Association of Electrical Distributors (Board of Governors), Skytop Lodge, Skytop, Pa.

October 28-29, 1957 — Annual Meeting, United States National Committee, International Commission on Illumination, Nittany Lion Inn, University Park, Pa.

Week of November 10, 1957 — National Electrical Contractors Association, Cincinnati, Ohio.

November 11-15, 1957 — National Electrical Manufacturers Association, Traymore Hotel, Atlantic City, N. J.

November 18-21, 1957 — 10th Exposition of the Air-Conditioning and Refrigeration Industry, Navy Pier, Chicago, Ill.

December 1-6, 1957 — The American Society of Mechanical Engineers, Annual Meeting, Hotel New Yorker, New York, N. Y.

January 20-24, 1958 — American Institute of Electrical Engineers, Winter General Meeting, New York, N. Y.

January 27-29, 1958 — American Society of Heating and Air-Conditioning Engineers, Incorporated, Annual Meeting, Pittsburgh, Pa.

February 9-15, 1958 — National Electrical Week.

February 20-21, 1958 — 14th Annual National Wiring Promotion Conference, Statler Hotel, Detroit, Mich.

March 2-5, 1958 — National Electric Sign Association, National Convention, Shamrock Hilton Hotel, Houston, Texas.

June 9-13, 1958 — National Association of Electrical Distributors, 50th Annual Convention, San Francisco, Calif.

June 23-27, 1958 — American Institute of Electrical Engineers (Summer General Meeting), Buffalo, N. Y.

August 17-22, 1958 — Illuminating Engineering Society (National Technical Conference), Royal York Hotel, Toronto, Canada.

August 19-22, 1958 — American Institute of Electrical Engineers, Pacific General Meeting, Sacramento, Calif.

October 13-15, 1958 — National Electronics Conference, Inc., Hotel Sherman, Chicago, Ill.

October 20-24, 1958 — National Safety Council (46th National Safety Congress & Exposition), Chicago, Ill.

October 27-31, 1958 — American Institute of Electrical Engineers (Fall General Meeting), Pittsburgh, Pa.

November 10-14, 1958 — National Electrical Manufacturers Association (Annual Meeting), Traymore Hotel, Atlantic City, N. J.

(*Continued from page* 17A)

books in architectural colleges, electric-lighting systems are still lumped with other strictly mechanical services like plumbing, heating, and air-conditioning. Lighting gets little attention in most architectural schools, too little for its real importance. There are reasons, some of which may be laid on our doorstep.

Any aesthetic study of the morphology of lighting systems in today's new buildings in the period of 1938-1958 would uncover a preponderance of attending to *function* rather than *form* . . . this oft-times to the despair of the architect. Ward Harrison once stated it like this in a discussion on glare and comfort: "Every new light source has initially been used bare and conspicuously. The customer seemed to want to see as much of his new purchase as he could."

It is not difficult to find reasons why our Society shows increased interest in the allied professions by sponsoring an Allied Arts activity. Our contests bring architects, engineers, and designers together as students, at a not-too-early stage in their careers. It brings them together in intimate liaison; they learn something of each other's problems; they learn something of each other's language; they break down some misconceptions, doubts, and preconceived ideas which ordinarily would beset them later in their professional life, when they might not have the benefit of enlightened guidance.

The Allied Arts contests are run jointly by professionals in the three fields (as an ideal arrangement). Sometimes there are two, there should not be less. In every group so far set up, a tangential advantage is that the Committeemen of the professions learn to know each other better. They help the schools and something rubs off the schools onto them.

In the final analysis, the schools in town help the professions directly by supplying graduates who have learned something more than the usual textbook approach. They also meet local professional architects and engineers and designers who would not otherwise become acquainted with the students until they knock on the door . . . (or these days being what they are, until they are ushered in after being met at the airport by the president).

The method of starting an Allied Arts contest varies with the schools included and the educational contributions in time and data the Section or Chapter can offer. In the most successful, by present standards, the approach is made by an informal committee of I.E.S. and A.I.A. (a minimum), plus A.S.I.D., I.D.I., or A.I.D. members. The financing of prizes, Certificates of Award, and similar expense items is done on a mutual basis. It is a good plan to prorate the expense, according to the number of architect, engineer, and design students in the contest. Each profession can thus "take care of its own."

The national Allied Arts Committee consists largely of a general chairman, vice chairman, and all Section or Chapter chairmen of local A.A. committees. An exchange of problems is an annual event at the annual meeting. The annual exhibit of prize-winning drawings at the National Conference, now in its third year, is new, but has aroused much interest on the part of conferees, so much so that requests have been made to make a travelling exhibit out of them during the rest of the year. Their viewing stimulates interest and aids instruction in student classes.

In the course of any Allied Arts program, an excellent opportunity exists "to disseminate knowledge relating thereto," in doing "crit" work directly in classes. The advisors are best selected for their knowledge of lighting in general and the particular field of the art about which the problem centers. Most programs begin with general lectures where needed, or a review in the case of groups who have taken formal courses in lighting, such as at Kent State University, Case Institute of Technology, and others. These sessions are best augmented by tours of notable light-and-architecture examples in the vicinity, Lighting Institutes, and such.

A convenient way to get started is to use the A.A. contest as a followthrough on a design problem previously handled in class. The University of Manitoba used a church problem this year by this method; Kent State had a school problem, similarly. Lighting and decorating these made satisfactory projects, concentrating attention on lighting, as it should be. At Kent, one program requirement was to build a scale model of some luminous element, which was a part of the team's overall solution. At Manitoba, the program was a ten-day one; at Kent it lasted five weeks. Prof. Joseph Morbito of Kent is scheduling a ten-week program next year for seniors.

It should be pointed out that these differences in programs' duration-time are right in line with the concept that the Allied Arts activity is based on building strong local groups. Each is purposely urged to be self-governing, to make its own rules, and thus build interest and communication with local professionals and local firms. That the representatives of these firms have a special interest in the students (usually seniors) is understandable.

Local sites are desirable as problem sites. These have more real and practical significance in teaching. Lighting, like architecture, is a three-dimensional study. Actual homes, student unions, hotels, restaurants, chapels, and the like, which need new or relighting and decorating, are typical choices. The student teams collectively study the structures, take measurements, photographs, and make sketches on the spot, and work together in a professional manner. A representative of the owner can usually be persuaded to be on hand to answer questions. He is often both honored and delighted to be on the jury, when prize-winners and runners-up are chosen.

In a growing number of Sections and Chapter meeting programs, the AIA-IES-*plus* Joint Meeting, where student drawings and prizes and other awards are presented, is often the best attended meeting of the year. (Program chairmen, please note.)

It is a fitting observation to close this piece by saying that President Kirk M. Reid has with Past Presidents Waterman, Hartenstein and Jones consistently bestowed official blessings on all Allied Arts Committee Chairmen in their local endeavors. On this note, we cannot help but predict a healthy growth. — K. A. STALEY, *General Chairman, Allied Arts Committee.*

National Wiring Bureau New Name for NAWB

Effective immediately the National Adequate Wiring Bureau will henceforth be known as "The National Wiring Bureau." This announcement was made by Carl T. Bremicker, Chairman of the Bureau, following a unanimous vote of the Executive Committee in favor of dropping the word "Adequate" from the Bureau's name. When announcing the change, Mr. Bremicker emphasized:

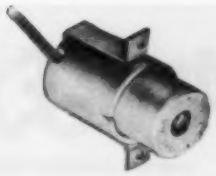
1. The scope of the Bureau's program will not change. It will continue to be devoted *entirely to the promotion of sufficient wiring* to permit full use of electricity in residential, commercial and institutional buildings.
2. As in the past, the Bureau will continue to maintain a strictly neutral position with regard to the relative merits of specific wiring materials or methods, leaving such matters in the hands of local and national Electrical Code authorities.
3. In changing the name of the Bureau itself, it is not intended to impose a similar change upon local Bureaus. Where the word "Adequate" appears in the name of a local Bureau, any decision to retain or omit it will be left entirely to the local organization itself.

(*Continued on page* 23A)

Channel Screw Terminal Type
for T-8 Lamps

Channel "Quick Connect" Type
Rear Terminal Tabs for T-8 Lamps

Channel "Quick Connect" Type
Front Terminal Tabs for T-8 Lamps

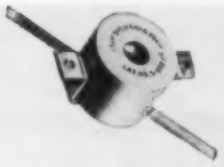


Slimline Plunger—Butt-on
High Voltage End Lead Terminal Type
—with or without mounting bracket
for Slimline Lamps

Medium—Single Screw Terminal
Type for T-8 and T-12 Lamps

Medium—Combination Screw Terminal
Type for T-8 and T-12 Lamps

Medium—Butt-on
Lead Terminal Type
for T-8 and T-12 Lamps



Slimline Plunger—Butt-on
Low Voltage End Lead Terminal Type
—with or without mounting bracket
for Slimline Lamps

Slimline—Butt-on High Voltage End
Screw Terminal Type
for Slimline Lamps

Slimline—Butt-on Low Voltage
End Screw Terminal Type
for Slimline Lamps

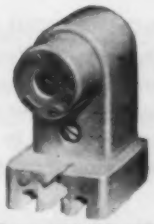
Sylvania fills every basic need for

Fluorescent Wiring Devices

- Sylvania's complete line can provide the exact lamp holder or starter socket to meet your requirements.

These wiring devices are carefully manufactured to Sylvania's exacting standards, and are approved by Underwriters' Laboratories and Canadian Standards Association Approvals Laboratories.

When you need the best in fluorescent wiring devices, see Sylvania. For complete details and specifications, write for catalog.



Slimline Fixtures High Voltage End
Screw Terminal Type
for Slimline Lamps

Slimline Fixtures Low Voltage End
Screw Terminal Type
for Slimline Lamps

Medium—Separate
Lead Terminal Type

Medium—Butt-on
Lead Terminal Type
—with or without mounting bracket

SYLVANIA PARTS DIVISION

Sylvania Electric Products Inc., Parts Division, Warren, Pennsylvania

SPECIAL WIRE · METAL STAMPINGS · MOLDED PLASTIC · ELECTRONIC COMPONENTS

4-way service from one source

4 G-E BALLAST EXTRAS YOU

EXCLUSIVE SOUND-RATING SYSTEM

NO GUESS WORK IN CHOOSING THE RIGHT BALLAST *before* **installation to fit the job. General Electric's exclusive sound-rating system and copyrighted sound-rating calculator will enable you to give your customers a fluorescent ballast-fixture combination to meet the sound-level requirements for *every* application.**

APPLICATION ENGINEERING

SPECIALLY TRAINED G-E SALES ENGINEERS are located throughout the country. More than 50 of these men are available to help you with on-the-spot ballast application problems. Design engineers from the G-E Ballast Department can be of great assistance to you on especially involved application problems.

This sticker on Your Carton Says . . .

HERE'S QUALITY *PLUS*

Attach this familiar sticker to every one of your cartons that contain a fixture equipped with General Electric ballasts. Your customers can then see at a glance that here is a top-quality ballast-fixture combination. Call your local General Electric ballast sales engineer for more details.

GET AT NO EXTRA COST!

NATIONWIDE SERVICE ENGINEERING

THE NATIONWIDE SERVICE ENGINEERING help offered by General Electric is unmatched by any other fluorescent ballast manufacturer. General Electric service engineers are available on call to help you, your customers, and fluorescent lighting users immediately whenever or wherever a ballast problem arises.

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G.E. MAINTAINS BALLAST WAREHOUSES throughout the country to help you meet emergencies and unforeseen requirements. This means you can plan orders for factory delivery and still count on General Electric's extensive warehouse network for immediate delivery on most popular models from local back-up stock.

Only from General Electric can you get all of these free ballast extras to help you reduce costly complaints and service expense.

When you equip your fixtures with G-E ballasts you are not only providing the finest product available but you give your fixtures extra selling features because these services are available to your customers, too.

No matter where your customers are located, they can get immediate free replacement of G-E ballasts which fail within warranty from their nearest G-E Ballast Service Center.

Take advantage of G.E.'s extra services to be sure that every fixture you sell will operate properly in the application for which it was designed. You can learn more about how specifying G-E ballasts can benefit you by calling your local G-E Apparatus Sales Office, or write to General Electric Company, Section 401-51, Schenectady 5, New York.

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When Keen Vision is Important...

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Prescribed for your Glasses...

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Exact specification is the basis of an optical prescription... The same holds true in planning any form of lighting... Holophane's undeviating precision in manufacturing prismatic products for lighting just can't be duplicated by "rolling" methods. Every Holophane lens is individually PRESSED — one by one — on equipment specially built for the operation. It is only by this careful process that we can keep the prismatic patterns precise enough to *direct and control* the light with utmost accuracy. This craftsmanship makes the difference between *specification* and *approximation*... Holophane CONTROLENS*, Reflectors and Refractors are the vital components of *custom-engineered* lighting systems, scientifically designed for the specific purpose... They offer finest quality, consistently predictable performance, and low cost per unit in terms of light delivered.

To be sure of quality... look for the name Holophane impressed in each piece

For Better Lighting Holophane ... Be Specific

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THE HOLOPHANE CO., LTD., 415 KIPLING AVE. SO., TORONTO 14, ONTARIO

At the Home Lighting Workshop, five-day seminar on residential lighting sponsored by Arizona Public Service and Arizona State College, Myrtle Fahsbender, second from left, explains a new fixture design. Left to right, Audie E. Ashcraft, Southern California Edison Co., Miss Fahsbender, Dr. Jessie M. Rannels, Arizona State College, Jackson B. Hacker, San Diego Gas and Electric Co., and Byron Payne, Arizona Public Service Co. Dr. Rannels and Mr. Payne were co-chairmen of the workshop.

(*Continued from page* 18A)

4. No change is contemplated in the Wiring Certification program, nor in the official Certification emblem. It will continue to read "Adequate Wiring — Certified." Many utilities, electrical leagues and local adequate wiring committees have invested substanital sums over the years to publicize and popularize the certification program and the certification emblem in their own communities. This makes it inadvisable to consider any change in this phase of the National Wiring Bureau's program.

5. Similarly, the companion emblem which is available for general use (with or without the Certification program) which now reads "Adequate Wiring Serves and Saves" also will continue to be used.

The National Wiring Bureau's Executive Committee hopes and expects that this change in its name will help to bring about full cooperation with the program from the electrical industry.

Home Lighting Workshop Arizona Success

An outstandingly successful educational program in home lighting was completed recently in Arizona. Some 60 educators, instructors, designers and others attended a five-day Home Lighting Workshop jointly sponsored by the Arizona Public Service Company, and Arizona State College at Tempe. The course included sessions on both interior and exterior home lighting. One hour's credit was given by Arizona State College for the five-day seminar.

As a basic foundation for the overall subject, lighting theory, the science of seeing, lighting terms and calculations were explained at the outset of the course. Indoor lighting lectures and demonstrations, conducted by Miss Myrtle Fahsbender, Director of Residential Lighting for Westinghouse Electric Corp., covered every room of the house. Other sessions included the relationship between lighting and design; appraisal of fixtures, decorative lighting techniques, and outdoor lighting.

Final examination for college credit closed the successful series.

Certified Lighting Course For Los Angeles Contractors

A new series of seven weekly classes on sales promotion and lighting design is being offered to electrical contractors in the Los Angeles area, sponsored by the Certified Lighting Association there. The course will be held in cooperation with Los Angeles City schools and the Electric League of Los Angeles.

Classes start October 8 and continue weekly every Tuesday through November 19, at the John Adams Junior High School, Los Angeles. Enrollment is limited to 40 students; fee for the course is $9.00.

Under the direction of T. H. Shepherd as Chairman of the CLA Educational Committee, and Roy H. Kreyser as Coordinating Director, the program will feature the following subjects:

October 8 — Language of Lighting, by T. H. Shepherd, Department of Water and Power, Los Angeles.

October 15 — Lamps and the Job They Do, by J. Roy Jones, Westinghouse Electric Corp., and Ballasts, by Bill Jones, Smoot-Holman Co.

October 22 — Basic Lighting Design, by Ed. Balogh, Sunbeam Lighting Co.

Octoger 29 — Lighting Design for Offices, by Bill Jones, and How to Sell Office Lighting, by Ed Balogh.

November 5 — Lighting Design for Merchandising, by D. A. Romanoff, Ruby Lighting Corp., and How to Sell Lighting for Merchandising, by T. H. Shepherd.

November 12 — Lighting Design for Industrial Interiors, by R. E. Bevan, Sylvania Electric Products Inc., and How to Sell Industrial Lighting, by R. L. Ford, Sunbeam Lighting Co.

November 19 — Floodlighting Calculations, by W. R. McMillan, Westinghouse Electric Corp., and Floodlighting Applications, by R. S. Clubley, Smoot-Holman Co.

List of I.E.S. Fellows

With the election of ten new Fellows, reported elsewhere in this issue, the list of living I.E.S. Fellows is as follows:

ALAMO SECTION

DARLEY, WILLIAM G. (1948), Consulting Engineer, 164 USAA Building, P. O. Box 6743, San Antonio, Texas.

HARMON, DARELL B. (1947), Texas State Department of Health, Austin, Texas.

CAPITAL SECTION

BARBROW, LOUIS E. (1955), National Bureau of Standards, Washington 25, D. C.

BRECKENRIDGE, FRANCIS C. (1949), National Bureau of Standards, Washington 25, D. C.

CLEAVER, OSCAR PAYNE (1946), Engineer Research & Development Lab., Ft. Belvoir, Va.

GIBSON, KASSON S. (1954), 4817 Cumberland Ave., Chevy Chase 15, Md.

NICKERSON, DOROTHY (1956), U. S. Dept. of Agriculture, Cotton Div., AMS, Washington 25, D. C.

PEARSON, H. J. C. (1953), 1619 Sunken Road, Fredericksburg, Va.

TEELE, RAY P. (1957), National Bureau of Standards, Washington 25, D. C.

SHARP, HOWARD M. (1945), Walling, Bickley & Sharp, Inc., 1912 N St. N.W., Washington 6, D. C.

CENTRAL NEW YORK SECTION

CLARKE, ALBERT HOWE (1955), Crouse Hinds Co., Syracuse 1, N. Y.

COTTRELL, CASPER L. (1955), Cornell University, Phillips Hall, Ithaca, N. Y.

STRONG, EVERETT M. (1952), Cornell University, Phillips Hall, Ithaca, N. Y.

CHICAGO SECTION

BENSON, BENJAMIN S., JR. (1955), Benjamin Electric Mfg. Co., Des Plaines, Ill.

(*Continued on page* 26A)

Change to New **Westinghouse Mercury Lamps...** get up to **30% more light** on work areas

More Westinghouse Job-Tailored Mercury Lamps are in use today than all other brands combined

Not only does Westinghouse make and sell more kinds and types of Mercury Lamps than anyone else, their pioneering leadership pays off in *substantial installation and operating economies.*

Westinghouse Mercury Lamps give *more light when new . . . more light for a longer life.* This means maintenance and replacement costs are reduced without sacrificing vitally needed light levels and efficiency standards.

Basic construction advances are another reason why you should specify Westinghouse for plant and factory lighting. For instance:

- Thorium-coated electrodes provide HIGHER LIGHT OUTPUT
- Molybdenum Ribbon Seal assures GREATER DEPENDABILITY, LONGER LIFE
- Hi-Temp Life-Time Bases eliminate INSTALLATION AND SERVICE BREAKAGE

Get the full story from a trained lighting expert who understands your problems. Write, wire or call your Westinghouse Lamp Distributor or the Westinghouse Lamp Division, Bloomfield, New Jersey.

More light for your money... indoors and out... with Westinghouse Job-Tailored Mercury Lamps

YOU CAN BE SURE...IF IT'S

IMPROVED SEMI-REFLECTOR FLUORESCENT-MERCURY LAMPS D-H12-WD AND D-H15-WD (1000 watts, 220-460 volts)

Now get *up to 30% more light* in dusty areas merely by changing to the new, improved Westinghouse Semi-Reflector Fluorescent-Mercury Lamps.

Every Westinghouse D-H12-WD and D-H15-WD Mercury Lamp has a sealed-in phosphor coated reflector that directs the light downward . . . where it is needed!

Light output remains higher because dust, dirt and grime cannot impair the efficiency of the sealed-in reflector. Costly reflector cleaning operations are eliminated.

The phosphor coating provides golden white color-corrected light for truer color rendition.

In addition, famous Westinghouse Weather Duty™ construction using special glass prevents damage from condensation, water or industrial fumes.

Westinghouse

(Continued from page 23A)

CHURCH, ERIC H. (1956), Lighting Products Inc., 1549 Park Ave. W., Highland Park, Ill.

FOULKS, WILLIAM V. C. (1952), Curtis Lighting, Inc., 6135 W. 65th St., Chicago 38, Ill.

HARDACRE, GILBERT K. (1956), Public Service Co., Div. of Commonwealth Edison Co., 51 W. Jackson St., Joliet, Ill.

JAMES, LEONARD V. (1947), Illuminating Engineering Consultant, 513 S. Catherine Ave., La Grange, Ill.

STAIR, J. L. (1945), 6946 S. Euclid Ave., Chicago 49, Ill.

TILLSON, EDWIN D. (1945), 2507 Lincoln St., Evanston, Ill.

ZERSEN, C. W. (1953), Chicago Lighting Institute, 140 S. Dearborn St., Chicago 90, Ill.

CLEVELAND SECTION

BARR, ARTHUR C. (1955), General Electric Co., Nela Park, Cleveland 12, Ohio.

BAUMGARTNER, GEORGE R. (1953), General Electric Co., Nela Park, Cleveland 12, Ohio.

BROWN, WILLARD C. (1945), General Electric Co., Nela Park, Cleveland 12, Ohio.

COMMERY, EUGENE W. (1950), General Electric Co., Nela Park, Cleveland 12, Ohio.

CUTLER, C. M. (1952), General Electric Co., Nela Park, Cleveland 12, Ohio.

DOWNES, ARTHUR C. (1947), 2181 Niagara Drive, Lakewood 7, Ohio.

EGELER, C. E. (1954), 1078 Brandon Road, Cleveland 12, Ohio.

FORSYTHE, W. D. (1947), 15006 Terrace Road, Cleveland 12, Ohio.

FRANCK, KURT (1954), Holophane Company, Inc., Newark, Ohio.

GUTH, SYLVESTER K. (1953), General Electric Co., Nela Park, Cleveland 12, Ohio.

HARRISON, WARD (1945), 23475 Stanford Road, Cleveland 22, Ohio.

HORTON, G. A. (1956), Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

KAHLER, WILLIAM H. (1953), Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

KETCH, JAMES M. (1950), General Electric Co., Nela Park, Cleveland 12, Ohio.

LOZIER, W. WALLACE (1957), National Carbon Research Labs., P. O. Box 6116, Cleveland 1, Ohio.

LUCKIESH, MATTHEW (1945), 21175 Shaker Blvd., Shaker Heights 22, Ohio.

MAGDSICK, H. H. (1945), 15925 Van Aken Blvd., Shaker Heights, Cleveland, Ohio.

PENNOW, WILLIS A. (1955), Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

POTTER, WENTWORTH M. (1953), General Electric Co., Nela Park, Cleveland 12, Ohio.

PRIDEAUX, GWILYM F. (1956), General Electric Co., Nela Park, Cleveland 12, Ohio.

PUTNAM, RUSSELL C. (1948), Case Institute of Technology, Cleveland 6, Ohio.

REID, KIRK M. (1948), General Electric Co., Nela Park, Cleveland 12, Ohio.

RODGERS, ALSTON (1957), General Electric Co., Nela Park, Cleveland 12, Ohio.

ROPER, VAL J. (1949), General Electric Co., Nela Park, Cleveland 12, Ohio.

ROWTEN, DANA W. (1957), Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

STURROCK, WALTER (1946), General Electric Co., Nela Park, Cleveland 12, Ohio.

WAKEFIELD, GEORGE P. (1952), The Wakefield Co., Vermilion, Ohio.

WEBBER, MARY E. (1955), General Electric Co., Nela Park, Cleveland 12, Ohio.

WEITZ, C. E. (1955), General Electric Co., Cleveland 12, Ohio.

WINKLER, FREDERIC C. (1947), Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

CONNECTICUT SECTION

BEALS, GILLSON W. (1953), The Miller Co., Meriden, Conn.

FARNSWORTH, DEAN, LT. COMDR. U.S.N.R. (1953), U. S. Naval Submarine Base, Medical Research Lab. Box 45, New London, Conn.

NEIDHART, JOHN J. (1954), The Miller Co., Meriden, Conn.

SIMPSON, RICHARD E. (1946), Consulting Engineer, 97 South Main St., West Hartford, Conn.

EASTERN NEW YORK SECTION

BOCK, JOHN E. (1952), 6 Irving Road, Scotia 2, N. Y.

HAWKINS, LAURENCE A. (1947), 1130 Wendell Ave., Schenectady 8, N. Y.

FLORIDA SECTION

DICKENSON, A. F. (1945), 1455 Harbor Drive, Sarasota, Fla.

GOLDEN GATE SECTION

BAKEMAN, C. T. (1947), C. T. Bakeman & Associates, 445 Bryant, San Francisco, Calif.

FINCH, DAN M. (1954), University of California, Berkeley, Calif.

MIAMI VALLEY SECTION

FRY, GLENN A. (1953), Ohio State University, Columbus, Ohio.

MICHIGAN SECTION

ANDERSON, EARL A. (1956), General Electric Co., 1400 Book Tower, Detroit 26, Mich.

GOODELL, PAUL H. (1947), Catalytic Combustion Corp., 4544 Grand River, Detroit, Mich.

SCHRENK, L. J. (1952), City of Detroit, Public Lighting Commission, 174 Atwater St., Detroit 26, Mich.

MILWAUKEE SECTION

ILLING, I. L. (1947), Wisconsin Electric Power Co., 231 W. Michigan St., Milwaukee 1, Wis.

LAUPP, CHARLES N. (1956), Wisconsin Electric Power Co., 231 W. Michigan St., Milwaukee 1, Wis.

NEW ENGLAND SECTION

ALLPHIN, WILLARD (1950), Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass.

BROWN, RICHARD B., JR. (1945), Boston Edison Co., Boston 12, Mass.

HALVORSON, C. A. B. (1955), 25 Chestnut St., Salem, Mass .

JEROME, CHARLES W. (1957), Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass.

LOWELL, WILLIAM P., JR. (1953), Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass.

PARKER, ALLEN E. (1946), Worcester Polytechnic Institute, Worcester 2, Mass.

RADDIN, ELLERY H. (1952), Champion Lamp Works, 600 Broad St., Lynn, Mass.

NEW YORK SECTION

BEGGS, EUGENE W. (1952), Westinghouse Electric Corp., Bloomfield, N. J.

BERENS, CONRAD (1946), Ophthalmologist, 111 E. 59th St., New York 22, N. Y.

BUTTOLPH, L. J. (1952), 1 Columbus Ave., Cliffside Park, N. J.

CROUCH, CAZAMER L. (1946), Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

FAHSBENDER, MYRTLE (1954), Westinghouse Electric Corp., Bloomfield, N. J.

FERREE, GERTRUDE RAND, MRS. (1952), Institute of Ophthalmology, Presbyterian Hospital, 635 W. 165th St., New York 32, N. Y.

FREEMAN, GEORGE A. (1957), Westinghouse Electric Corp., Bloomfield, N. J.

HIBBEN, SAMUEL G. (1945), 31 Clinton Ave., Montclair, N. J.

JENSEN, BRUCE J. (1956), Public Service Electric & Gas Co., 80 Park Place, Newark, N. J.

LITTLE, WILLIAM F. (1945), 75 Dalton Road, Yonkers 2, N. Y.

LOGAN, HENRY L. (1947), Holophane Co., Inc., 342 Madison Ave., New York 17, N. Y.

RAMBUSCH, EDWARD V. A. (1952), Rambusch Decorating Co., 40 W. 13th St., New York 11, N. Y.

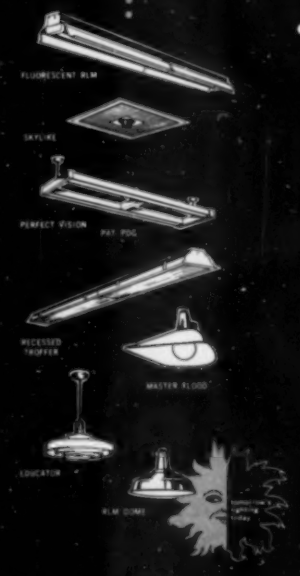
SALTER, ERNEST H. (1953), Electrical Testing Laboratories Inc., 2 East End Ave., New York 21, N. Y.

TAYLOR, GEORGE J. (1953), Day-Brite Lighting Inc., 161 E. 42nd St., New York 17, N. Y.

(Continued on page 42A)

from the electrical contractor's viewpoint...

Smoot Holman Stands Highest ...in lighting!



Ask the man who puts 'em up—he'll tell you the Smoot-Holman label on any fixture means:

1. Full light output
2. Better, more comfortable vision
3. Unique features for time-saving installation and maintenance
4. Long, trouble-free life
5. Flexibility to meet lighting problems
6. Expert help from factory trained lighting engineers

For information and assistance on your next lighting job call the nearest Smoot-Holman office or write direct.

SMOOT-HOLMAN INGLEWOOD, CALIFORNIA

We support the National Lighting Bureau

service in the west and southwest for all school, commercial and industrial lighting

extra large extrusions

KSH

doing the "impossible" in plastics

extra complex extrusions

Turning problem shapes into consistently uniform extrusions is a unique talent that has built KSH an industry-wide reputation for doing the "near impossible" in plastics! No challenge is considered too big or too tough. Remember, come to KSH for higher quality at a competitive price.

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SUSTAINING MEMBERS

Abolite Lighting Division
Jones Metal Products Co.
West Lafayette, Ohio — *E. F. Mulligan*

Acme Electric Corp.
Cuba, N. Y. — *J. A. Comstock*

Acme Lighting & Mfg. Co.
949 E. 31st St.
Los Angeles 11, Calif. — *Albert Sultan*

Active Electric Co.
5450 W. Fullerton Ave.
Chicago 39, Ill. — *Robert W. Winne*

Advance Electric Supply Co.
1102 N. Saginaw St.
Flint, Mich. — *C. W. Schagane*

Advance Transformer Co.
2950 N. Western Ave.
Chicago 18, Ill. — *A. E. Feinberg*

Alabama Power Co.
Birmingham 2, Ala. — *G. L. Morris*

Edw. P. Allison Co., Inc.
300 W. Washington St.
Chicago 6, Ill. — *C. W. Abrell*

Aluminum Co. of America
Sales Development Division
New Kensington, Pa. — *C. J. Hinton*

Amalgamated Electric Corp. Ltd.
584 Pape Ave., Toronto, Ont. — *W. A. Dalrymple*

American Concrete Corp.
5092 N. Kimberly Ave.
Chicago 30, Ill. — *J. W. Lewis*

American Electric Construction Co. Inc.
4453 N. Central Ave.
Chicago 30, Ill. — *Clyde W. Grove*

American Electric Supply Co.
5010 W. Irving Park Rd.
Chicago 41, Ill. — *Herbert Schwartz*

American Electric Supply Co.
175 Ann St., Hartford, Conn. — *L. A. Senofonte*

American Sterilizer Co.
2426 W. 23rd St., Erie, Pa. — *Ernest L. Thompson*

Appalachian Electric Power Co.
40 Franklin Rd., S. W., P. O. Box 2091
Roanoke, Va. — *G. J. Furr*

Appleton Electric Co.
1701-1759 Wellington Ave.
Chicago 13, Ill. — *Norton Appleton*

Arizona Public Service Co.
501 S. Third Ave.
Phoenix, Ariz. — *Don Willis*

Arkansas Power & Light Co.
Little Rock, Ark. — *Max Sudduth*

The Art Metal Co.
1814 E. 40th St.
Cleveland 3, Ohio — *G. E. Glatthar*

Atlantic City Electric Co.
1600 Pacific Ave.
Atlantic City, N. J. — *John B. Taylor*

Bakelite Co.
Div. of Union Carbide & Carbon Corp.
30 E. 42nd St., New York 17, N. Y. — *C. S. Myers*

Baltimore Gas & Electric Co.
1212 Lexington Bldg.
Baltimore 1, Md. — *M. C. Albrittain*

Barrett Division
Allied Chemical & Dye Corp.
40 Rector St., New York 6, N. Y. — *M. H. Bigelow*

Benjamin Electric Mfg. Co.
Des Plaines, Ill. — *B. S. Benson, Jr.*

Black & McDonald Limited
101 Parliament St.
Toronto, Ont. — *W. J. McDonald*

The Blommel Sign Co.
735 Wayne Ave.
Dayton 10, Ohio — *W. E. Blommel*

Blue Ridge Glass Corp.
Kingsport, Tenn. — *J. S. Herbert*

B M D and R Inc.
7020 Walker St., St. Louis Park
Minneapolis 16, Minn. — *Cecil H. Branham*

Board of Water and Light
116 W. Ottawa St., P. O. Box 570
Lansing 3, Mich. — *Roy Culham*

Boston Edison Co.
39 Boylston St.
Boston 12, Mass. — *R. B. Brown, Jr.*

British Columbia Electric Co. Ltd.
970 Burrard St.
Vancouver 1, B. C. — *Otto E. Zwanzig*

British Columbia Electric Co. Ltd.
820 Pandora Ave.
Victoria B. C. — *E. W. Arnott*

Brockton Edison Co.
36 Main St.
Brockton 67, Mass. — *Louis F. Eaton*

Buck Electrical Contractors Inc.
5246 W. Fullerton Ave.
Chicago 39, Ill. — *Anton J. Mayer*

Butler Electric Co. Inc.
2832 Washington Ave.
St. Louis, Mo. — *Harry Arendes*

C. & M. Products Ltd.
124 Crockford Blvd.
Scarboro, Ont. — *J. J. Caragata*

Cadillac Electric Supply Co.
431 E. Larned St.
Detroit 26, Mich. — *H. C. Simonton*

California Electric Power Co.
P. O. Box 512
Riverside, Calif. — *Gordon F. Burgess*

California Electric Supply Co.
12th & Folsom Sts.
San Francisco, Calif. — *Sol Cohen*

Camber Lighting Inc.
57 Montgomery St.
Jersey City, N. J. — *Leonard Borko*

Cambridge Electric Light Co.
46 Blackstone St.
Cambridge 39, Mass. — *James L. Corrigan*

Canadian General Electric Co. Ltd.
Industrial Products Division
224 Wallace Ave., Toronto, Ont. — *A. C. Calderone*

Canadian General Electric Co. Ltd.
Lamp Division
165 Dufferin St., Toronto, Ont. — *E. H. Lindsay*

Canadian Line Materials Ltd.
Postal Station H
Toronto 13, Ont. — *L. E. Messinger*

Canadian National Exhibition Association
Exhibition Park
Toronto 2B, Ont. — *H. E. McCallum*

Canadian Westinghouse Supply Co. Ltd.
195 Fleet St. E.
Toronto, Ont. — *S. W. McKnight*

Canning, Pekara Inc.
2144 N. Wood St.
Chicago 14, Ill. — *Claude E. Canning*

Celine, Inc.
P. O. Box 348
Batavia, Ill. — *Rudolph C. Hultgren*

Central Hudson Gas & Electric Corp.
50 Market St.
Poughkeepsie, N. Y. — *J. E. Doolittle*

Central Illinois Light Co.
316 S. Jefferson Ave.
Peoria 2, Ill. — *J. W. Brown*

Central Illinois Public Service Co.
607 E. Adams St.
Springfield, Ill. — *B. L. Palm*

Central Louisiana Electric Co. Inc.
715 Main St.
Pineville, La. — *P. R. Taylor*

Central Maine Power Co.
9 Green St.
Augusta, Maine — *Roland W. Hess*

Central Power & Light Co.
P. O. Box 2121
Corpus Christi, Texas — *James M. Williams*

Century Lighting, Inc.
521 West 43rd St.
New York 36, N. Y. — *Edward F. Kook*

Champion Lamp Works
Division of Consolidated Electric Lamp Co.
550 Lynnway, Lynn, Mass. — *Carleton M. Holden*

Chicago Electrical Supply Co.
420 N. Ashland Ave.
Chicago 22, Ill. — *Charles Lechner*

Cincinnati Gas & Electric Co.
4th & Main Sts.
Cincinnati 1, Ohio — *J. R. Hartman*

City of Burbank, Calif. — Public Service Dept.
P. O. Box 631
Burbank, Calif. — *Ralph Foy*

City of Glendale — Public Service Dept.
119 N. Glendale Ave.
Glendale 6, Calif. — *L. W. Grayson*

City of Riverside Electric Light Dept.
P. O. Box 826
Riverside, Calif. — *A. J. Kennedy*

City of Seattle — Dept. of Lighting
1015 Third Ave.
Seattle 4, Wash. — *P. C. Spowart*

City of Tacoma
Dept. of Public Utilities, Light Div.
P. O. Box 1639
Tacoma 1, Wash. — *Roy H. Weston*

The Cleveland Electric Illuminating Co.
75 Public Square
Cleveland 1, Ohio — *R. C. Hienton*

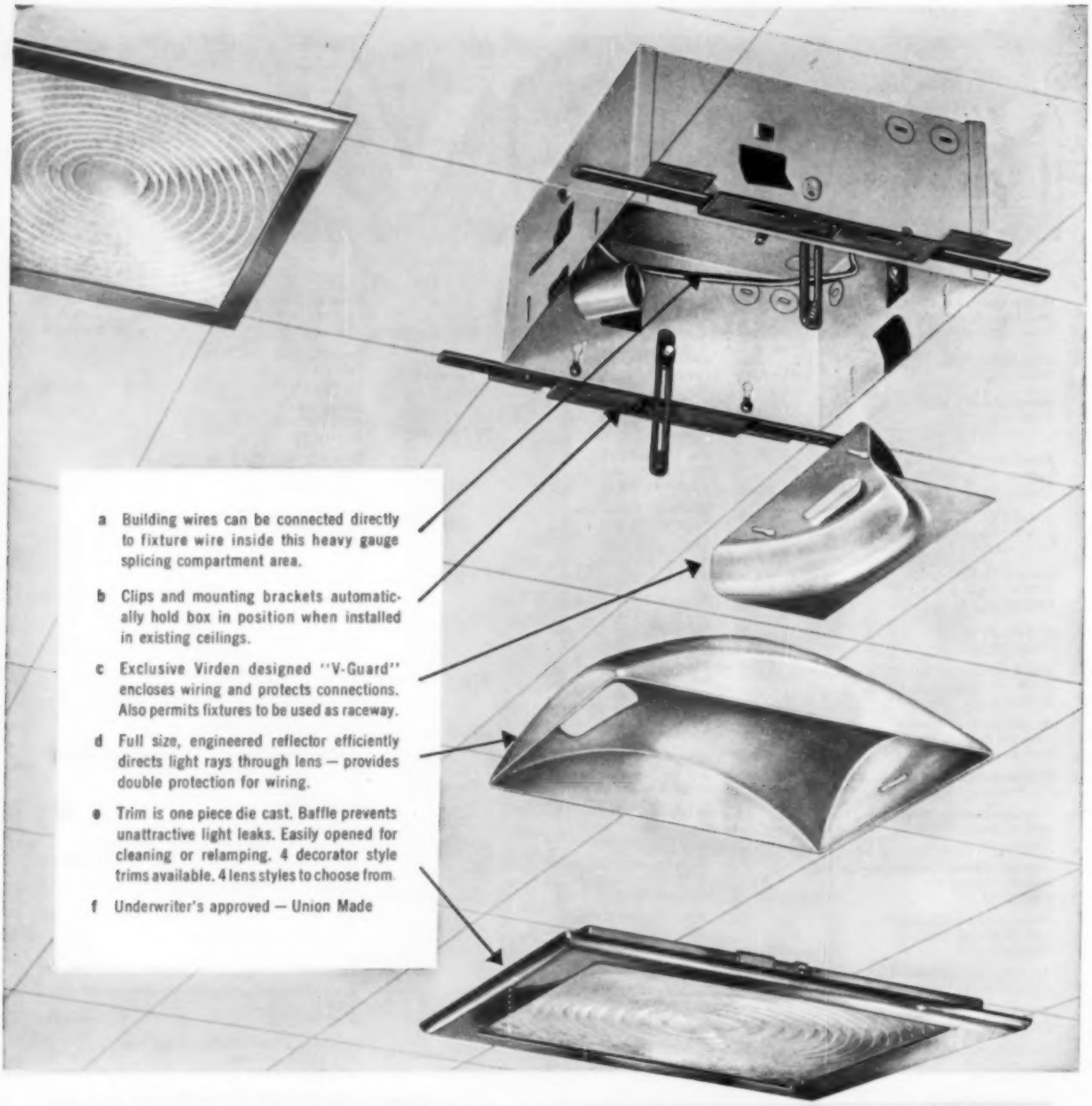
Colonial Premier Co.
466 W. Superior St.
Chicago 10, Ill. — *M. H. Dottenheim*

Columbia Electric & Mfg. Co.
1024 W. Ide Ave.
Spokane, Wash. — *Walter A. Toly*

Columbus & Southern Ohio Electric Co.
215 N. Front St.
Columbus, Ohio — *H. S. Corn*

(Continued on page 32A)

Name of official representative given in italics.


a Building wires can be connected directly to fixture wire inside this heavy gauge splicing compartment area.
b Clips and mounting brackets automatically hold box in position when installed in existing ceilings.
c Exclusive Virden designed "V-Guard" encloses wiring and protects connections. Also permits fixtures to be used as raceway.
d Full size, engineered reflector efficiently directs light rays through lens — provides double protection for wiring.
e Trim is one piece die cast. Baffle prevents unattractive light leaks. Easily opened for cleaning or relamping. 4 decorator style trims available. 4 lens styles to choose from.
f Underwriter's approved — Union Made

AVAILABLE IN 4 TRIM FINISHES — 4 LENS STYLES IN ANY COMBINATION

Polished Copper with Bent Decorator Glass
Satin Aluminum with Fresnel Lens
Polished Brass with Albalite Lens
Chromium with Drop Opal Glass

3 SIZES

75-Watt 8 x 8 x 5 Housing — 9⅜ x 9⅜ Trim

100-Watt 10 x 10 x 5 Housing — 11⅜ x 11⅜ Trim

150-Watt 12 x 12 x 5 Housing — 13⅜ x 13⅜ Trim

VIRDEN proudly presents the FIRST RECESSED FIXTURE that is INTERNALLY-PREWIRED!*

A major improvement by Virden! Now for the first time *all* wiring connections can be made within the fixture itself. No external outlet box to wire in. Standard house wire is entirely suitable for connections inside the housing. What's more, the unit can be used as a raceway if desired. And it has full Underwriter's approval.

The secret is Virden's exclusive design shown opposite. All parts assemble into one compact, square housing, permitting easier installation especially in areas with close quarters. The patented "V-Guard" covers all connections eliminating the need for an external outlet box. The specially engineered full size reflector not only improves lighting efficiency but serves as an added safeguard for the wiring.

In 3 sizes — 75 watts, 100 watts and 150 watts — the unit features a one-piece die cast trim, baffled to eliminate light leaks. Four trim finishes with four lens styles provide a wide range of decorative lighting possibilities, both indoors and out.

Use this new Virden fixture on your next lighting job. See for yourself how much easier it is to install, the wiring time it saves. Your Virden distributor has these new fixtures in stock now. Order yours today.

(*Patent Applied For)

FOR NEW WORK OR OLD – RESIDENTIAL OR COMMERCIAL

The compactness of this new Virden recessed fixture makes it an excellent unit for new work. It requires a minimum of space. Has mounting brackets and adjustment slots for a tight fit on ceilings. Ample knockouts for fast wire connections. (hanger bars optional)

This new Virden fixture is ideal for installation in existing ceilings, too. Simply cut a hole ⅛" wider than the housing, insert in opening and wire. The special spring clips hold the housing snugly when used in conjunction with the mounting brackets.

The new Virden recessed fixture is excellent for commercial and residential use. Installation costs less and the 4 lens styles and finishes available make possible a wide range of efficient and decorative lighting, indoors and out.

VIRDEN Lighting

virden

John C. Virden Co., Dept. IE, 6103 Longfellow Ave., Cleveland 3, Ohio

Member American Home Lighting Institute

(Continued from page 29A)

Commercial Light Co.
841 W. Washington Blvd.
Chicago 7, Ill. *Michael R. Fine*

Commonwealth Edison Co.
Public Service Company Division
51 W. Jackson St., Joliet, Ill. *G. K. Hardacre*

Compco Corp.
2251 W. St. Paul
Chicago 47, Ill. *S. J. Zagel*

The Connecticut Light & Power Co.
P. O. Box 2010
Hartford, Conn. *A. M. Wade*

Consolidated Edison Co. of N. Y. Inc.
4 Irving Place
New York 3, N. Y. *G. J. Gillen*

Consumers Power Co.
212 W. Michigan Ave.
Jackson, Mich. *D. E. Karn*

Consumers Public Power District
1452 25th Ave.
Columbus, Nebr. *W. H. Sinke*

Continental Electrical Construction Co.
3540 Southport Ave.
Chicago 13, Ill. *Leo W. Witz*

Corning Glass Works
Corning, N. Y. *F. F. Fleischman, Jr.*

Coyne Electrical School Inc.
500 So. Paulina St.
Chicago 7, Ill. *John Hanan*

Crouse-Hinds Co.
Syracuse, N. Y. *John S. Haney*

Crouse-Hinds Co. of Canada, Ltd.
1160 Birchwood Rd.
Scarboro, Ont. *F. R. Jeffery*

Crownlite Fluorescent Co.
110 Windsor Ave.
Mineola, N. Y. *A. L. Siegel*

Curtis Lighting, Inc.
6135 W. 65th St.
Chicago 38, Ill. *John A. Wright*

Curtis Lighting of Canada, Ltd.
195 Wickstead Ave.
Leaside, Toronto, Ont. *H. L. Wright*

Cutler Electrical Products Inc.
5524 Haverford Ave.
Philadelphia 39, Pa. *David Cutler*

Dallas Power & Light Co.
1506 Commerce St.
Dallas 1, Texas *C. A. Tatum*

A. L. Davis Co., Inc.
101 Central Ave.
Newark, N. J. *Arthur L. Davis*

Day-Brite Lighting Inc.
5401 Bulwer St.
St. Louis 7, Mo. *D. J. Biller*

The Dayton Power & Light Co.
25 No. Main St.
Dayton 1, Ohio *H. S. Nonneman*

Dazor Manufacturing Corp.
4483 Duncan Ave.
St. Louis 10, Mo. *P. L. Read*

Delaware Power & Light Co.
600 Market St.
Wilmington 99, Del. *W. A. F. Pyle*

Dept. of Water & Power, City of Los Angeles
Box 3669 Terminal Annex, 207 So. Broadway
Los Angeles 54, Calif. *Ivan L. Bateman*

Detroit Edison Co.
2000 Second Ave.
Detroit 26, Mich. *L. E. Tayler*

Detroit Electrical Contractors Association
740 Book Building
Detroit 26, Mich. *Carl J. Schoeninger*

The L. C. Doane Co.
10 New City St., Essex, Conn. *Harold F. Lorenz*

Dow Chemical Co.
Midland, Mich. *W. C. Goggin*

E. I. du Pont de Nemours & Co., Inc.
(Fabrics & Finishes Div.)
Wilmington 98, Del. *Jack Rode*

E. I. du Pont de Nemours & Co., Inc.
Polychemicals Dept.
Development and Service Section
Wilmington 98, Del. *Henry Peterson*

Duquesne Light Co.
435 Sixth Ave., Pittsburgh 19, Pa. *G. W. Ousler*

Duro Test Corp.
2321 Hudson Blvd.
North Bergen, N. J. *James L. Cox*

Eastern Fixture Co. Inc.
170 Vernon St., Boston 20, Mass. *Louis Gilman*

Eastman Kodak Co.
343 State St., Rochester, N. Y. *H. R. Patterson*

Ebasco Services, Inc.
2 Rector St., New York 6, N. Y. *W. L. Byrne*

Efengee Electrical Supply Co.
949 W. Chicago Ave., Chicago 22, Ill. *Lee Mirus*

Electrical Information Publications, Inc.
2132 Fordem Ave.
Madison 1, Wis. *D. W. Grosshandler*

Electrical Installations Co.
2144 West Van Buren
Chicago, Ill. *Louis Miglore*

Electrical Manufacturers Representative
Assoc. of Michigan Inc.
12638 Hamilton Ave.
Highland Park 3, Mich. *S. E. Dubois*

Electrical Products Corp.
1100 No. Main St.
Los Angeles 12, Calif. *L. A. Rice*

Electrical Testing Laboratories, Inc.
79th St. & East End Ave.
New York 21, N. Y. *Hoffman S. Beagle*

Electrical Wholesalers, Inc.
229 Whitehall St. S. W.
Atlanta, Ga. *John R. Thornton*

Electric Fixture & Supply Co.
1006 No. 20th St., Omaha, Nebr. *F. E. Foster*

Electric Supply Corp.
701 Jackson Blvd.
Chicago 6, Ill. *Peter V. Polton*

Electric Wholesale Supply Co.
2503 E. Michigan Ave.
Jackson, Mich. *Blair McGowan*

Electrolier Mfg. Co. Ltd.
5849 Boyer St.
Montreal, Que. *Bernard Issenman*

Electro Silv-A-King Corp.
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Chicago 8, Ill. *C. I. Schneider*

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130 No. Wells St., Chicago, Ill. *George A. Lang*

Emerson-Pryne Co.
P. O. Box 698, Pomona, Calif. *Roger W. Holston*

Ender Monarch Corp.
50 Sylvester St., Westbury, N. Y. *Lewis Grenadier*

Englewood Electrical Supply Co.
5801-03 S. Halsted St.
Chicago, Ill. *J. P. Anderson*

Enterprise Electric Co.
6507 Euclid Ave.
Cleveland, Ohio *William S. Fell*

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1970 N. Milwaukee Ave.
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Esty Manufacturing Co.
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5736 N. Western Ave.
Chicago 45, Ill. *William F. J. Fecht*

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Toronto 13, Ont. *J. E. Landers*

Fenestra Inc.
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Detroit 11, Mich. *E. W. Conover*

Fischbach, Moore & Morrissey, Inc.
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Chicago 2, Ill. *J. R. Meehan*

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Flood-Lite Service Inc.
212 Silver Lake Blvd.
Los Angeles 4, Calif. *B. J. Hartmann*

Florida Power & Light Co.
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Florida Power Corp.
101 Fifth St., South
St. Petersburg, Fla. *W. B. Shenk*

Fluorescent Equipment & Mfg. Co.
5105 Cowan Ave.
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352 Shaw Rd.
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Hillside, N. J. *Meyer H. Silverman*

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P. O. Box 660
Oakland 4, Calif. *Andrew W. Anderson*

W. Freeman & Son, Ltd.
275 Woodland Drive
Vancouver, B. C. *A. Freeman*

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4432 Olive St.
St. Louis 8, Mo. *Dan Michelson*

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1750 N. Ashland Ave.
Chicago 22, Ill. *G. G. Harney*

Garfunkel Co.
420-428 Hoboken Ave.
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Accessory Equipment Dept.
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Danville, Ill. *E. C. Schorr*

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Nela Park
Cleveland 12, Ohio *Willard C. Brown*

General Electric Co.
Outdoor Lighting Dept.
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General Electric Supply Co.
Div. General Electric Co.
1260 Boston Ave.
Bridgeport 9, Conn. *W. W. Booth*

General Fireproofing Co.
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Youngstown, Ohio *J. A. Saunders*

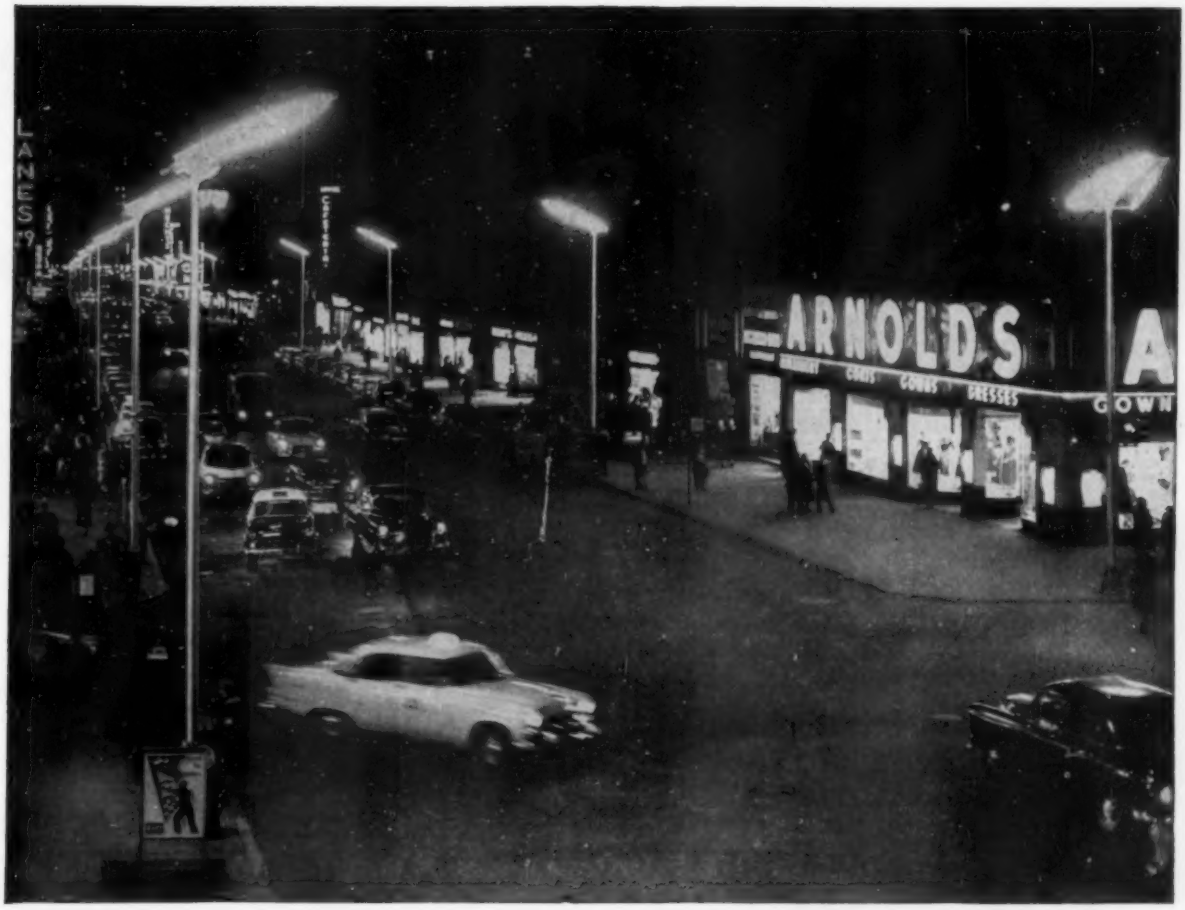
General Lighting Products Co.
468 Freylinghuysen Ave.
Newark 5, N. J. *N. H. Eglowstein*

The Georgia Power Co.
Electric Bldg., Atlanta 1, Ga. *C. M. Wallace, Jr.*

Gibson Manufacturing Co.
1919 Piedmont Circle, N. E.
Atlanta, Ga. *R. R. Gibson*

Gilbert Associates Inc.
607 Washington St., P. O. Box 1498
Reading, Pa. *Arthur H. Phillips*

(Continued on page 35A)



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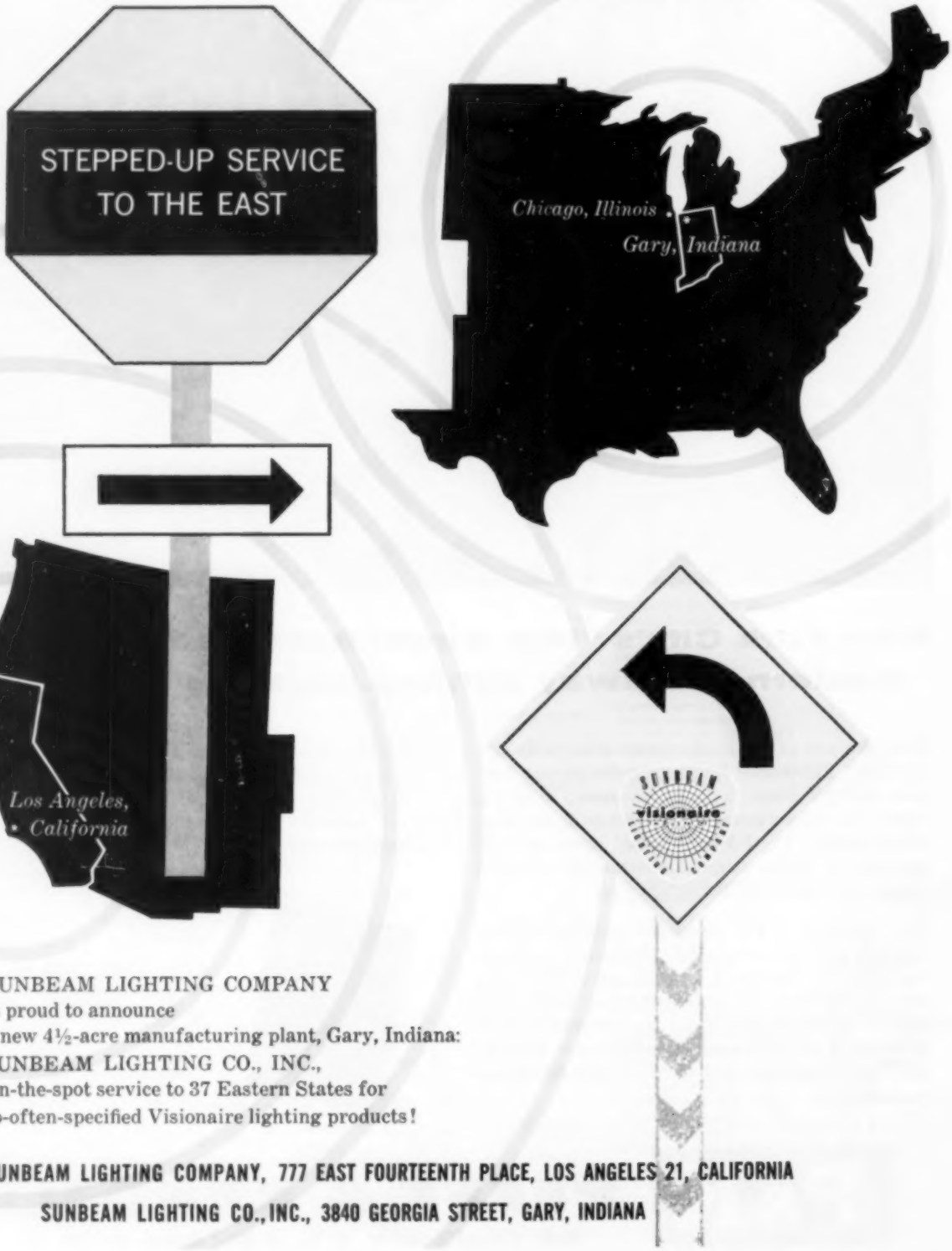

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(Continued from page 32A)

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Port Jervis, N. Y. — *J. F. Gillinder*

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Chicago 6, Ill. — *Arthur G. Brock*

Hawkins Electric Co.
1447 Washington Blvd.
Chicago 7, Ill. — *R. R. Hill*

Hexcel Products Inc.
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Berkeley, Calif. — *M. J. Connelly*

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New York 17, N. Y. — *H. L. Logan*

Holophane Co., Ltd.
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Toronto 14, Ont. — *Frank T. Groome*

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Pittsburgh 1, Pa. — *C. C. Warne, Jr.*

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Sycamore, Ill. — *G. B. Koch*

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Decatur 70, Ill. — *Allan Van Wyck*

Illuminating Engineering Co.
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Hazel Park, Mich. — *Bert C. Pretzer*

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Fort Wayne, Ind. — *J. H. K. Shannahan*

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Box 351, Cedar Rapids, Iowa — *Sutherland Dows*

Iowa-Illinois Gas & Electric Co.
United Light Bldg.
Davenport, Iowa — *Gordon Ames*

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Des Moines 3, Iowa — *N. Bernard Gussett*

Iowa Public Service Co., East Division
400 Commercial St.
Waterloo, Iowa — *C. R. Wagoner*

Iowa Public Service Co., Sioux City Division
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Sioux City, Iowa — *C. R. Tracy*

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Jeanette, Pa. — *Donald H. Crock*

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Bellwood, Ill. — *W. C. Anderson*

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Asbury Park, N. J. — *E. R. Drechsel, Jr.*

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Jewell Electric Products Inc.
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Bloomfield, N. J. — *Joseph G. Wares*

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Chicago 14, Ill. — *H. J. Kilburg*

Kingsport Utilities, Inc.
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Kingsport, Tenn. — *J. E. Wright*

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Lafayette, Ind. — *John C. Dewenter*

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284 Greenwich St.
New York, N. Y. — *Harold C. Hollowell*

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Swissvale, Pa. — *F. C. Ashe*

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Detroit 3, Mich. — *A. H. Galward*

Lawrence Electric Co.
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Leviton Mfg. Co.
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Brooklyn 22, N. Y. — *Jack Amsterdam*

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Memphis 7, Tenn. — *Murray Reiter*

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Cornwall-on-Hudson, N. Y. — *Eugene Littman*

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Mineola, N. Y. — *William J. Schmidt*

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(Continued on page 37A)

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THE NEW MILLER
Sovereign

- Alzak aluminum reflector
- 35° crosswise shielding
- 25% upward light

Now, with the new 8′ Miller Sovereign, you can efficiently harness the 26,000 lumen output of two G-E Power-Groove fluorescent lamps. It provides seeing comfort while enabling users to obtain high levels of light with fewer fixtures. The key comfort feature is the specially designed Alzak aluminum reflector with 35° crosswise shielding. *This limits brightness within the shielded zone to less than 1/8 that of comparable fixtures with porcelain enamel finish!* A 25% upward light component gives comfort a further assist by helping to control brightness contrasts. And the ventilated open top has a "self-cleaning" action which helps keep light output high and maintenance costs low. A louver with 30° lengthwise shielding is available.

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(Continued from page 35A)

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Luxor Lighting Products Inc.
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McNaughton-McKay Electric Co.
7000 Intervale Ave.
Detroit 38, Mich. *William T. McNaughton*

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Philadelphia 33, Pa. *Fred M. Pyle*

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16501 Livernois
Detroit 21, Mich. *Milton J. Doner*

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92 Center St.
Middletown, Conn. *Philip Busker*

Midwest Chandelier Co.
15th & Gentry Sts.
No. Kansas City 16, Mo. *Sidney Lefkovitz*

The Miller Co.
Meriden, Conn. *G. W. Beals*

Miller Electric Co. of Florida
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Pittsburgh 8, Pa. *R. E. Havener*

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Chicago 10, Ill. *Albert Kahn*

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Plastics Division
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Minneapolis 2, Minn. *W. L. Hayes*

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Morlite Equipment Co.
P. O. Box 106
Girard, Pa. *Finley J. Gordon*

Multi Electric Mfg. Co.
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Chicago, Ill. *Leo J. McDonald*

Municipal Light & Power Dept.
City of Pasadena, California
302 City Hall, Pasadena 1, Calif. *T. M. Goodrich*

Charles C. Munroe, Jr.
25741 Kennedy Dr.
Dearborn, Mich. *Charles C. Munroe, Jr.*

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Chicago 34, Ill. *N. E. Passman*

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Newark 3, N. J. *J. B. Seidman*

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New Bedford, Mass. *W. S. Fenstermacher*

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Denver, Colo. *Charles Newman*

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New Orleans, La. *E. N. Avegno*

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62 Henry St.
Binghamton, N. Y. *Earle C. Edwards*

Niagara Mohawk Power Corp.
300 Erie Blvd. W.
Syracuse 2, N. Y. *R. H. Stratton*

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Newport News, Va. *C. P. Andrew*

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North Adams, Mass. *A. D. Rhodes*

Northern Electric Co. Ltd.
1600 Notre Dame St. W.
Montreal, Que. *K. M. Bissell*

Northern Indiana Public Service Co.
5265 Hohman Ave.
Hammond, Ind. *J. C. Sackman*

Northern Light Co.
1657 N. Water St.
Milwaukee 2, Wis. *Fred Cramer*

Northern States Power Co.
Minneapolis 2, Minn. *Carl T. Bremicker*

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Halifax, N. S. *W. D. Graham*

The NL Corp.
2480 E. 22nd St.
Cleveland 15, Ohio *M. W. Terkel*

NuArt Lighting & Mfg. Co.
235 East 5th South St.
Salt Lake City, Utah *H. A. Schoepf*

Ohio Edison Co.
Akron 8, Ohio *Franklyn Dickinson*

Ohio-Midland Light & Power Co.
Canal Winchester, Ohio *J. E. Cathers*

The Ohio Power Co.
301-315 Cleveland Ave. S. W.
Canton 2, Ohio *R. W. Osterholm*

Oklahoma Gas & Electric Co.
Box 1498, Oklahoma City 1, Okla *Earle W. Gray*

Omaha Public Power District
720 Electric Bldg.
Omaha 2, Nebr. *E. E. Schwalm*

Pacific Gas & Electric Co.
245 Market St.
San Francisco 6, Calif. *O. R. Doerr*

Pacific Power & Light Co.
920 S. W. Sixth Ave.
Portland 4, Ore. *F. M. Reis*

Paramount Industries Inc.
G 1080 Ballenger Rd.
Flint, Mich. *B. R. Bailey*

Peerless Electric Ltd.
5585 Fullum
Montreal 36, Que. *L. A. Van Duzer*

Pennsylvania Electric Co.
222 Levergood St.
Johnstown, Pa. *R. G. Baker*

Pennsylvania Power & Light Co.
901 Hamilton St.
Allentown, Pa. *H. H. Brenan*

Pennsylvania Power Co.
19 E. Washington St.
New Castle, Pa. *P. G. Dingledy*

The Perfeclite Co.
1457 East 40th St.
Cleveland 3, Ohio *Joseph L. Jaffe, Jr.*

Pfaff & Kendall
84 Foundry St.
Newark, N. J. *M. J. Hamilton*

Philadelphia Electrical & Mfg. Co.
1228-36 N. 31st St.
Philadelphia 21, Pa. *R. A. Manwaring*

Philadelphia Electric Co.
1000 Chestnut St.
Philadelphia 5, Pa. *R. G. Rincliffe*

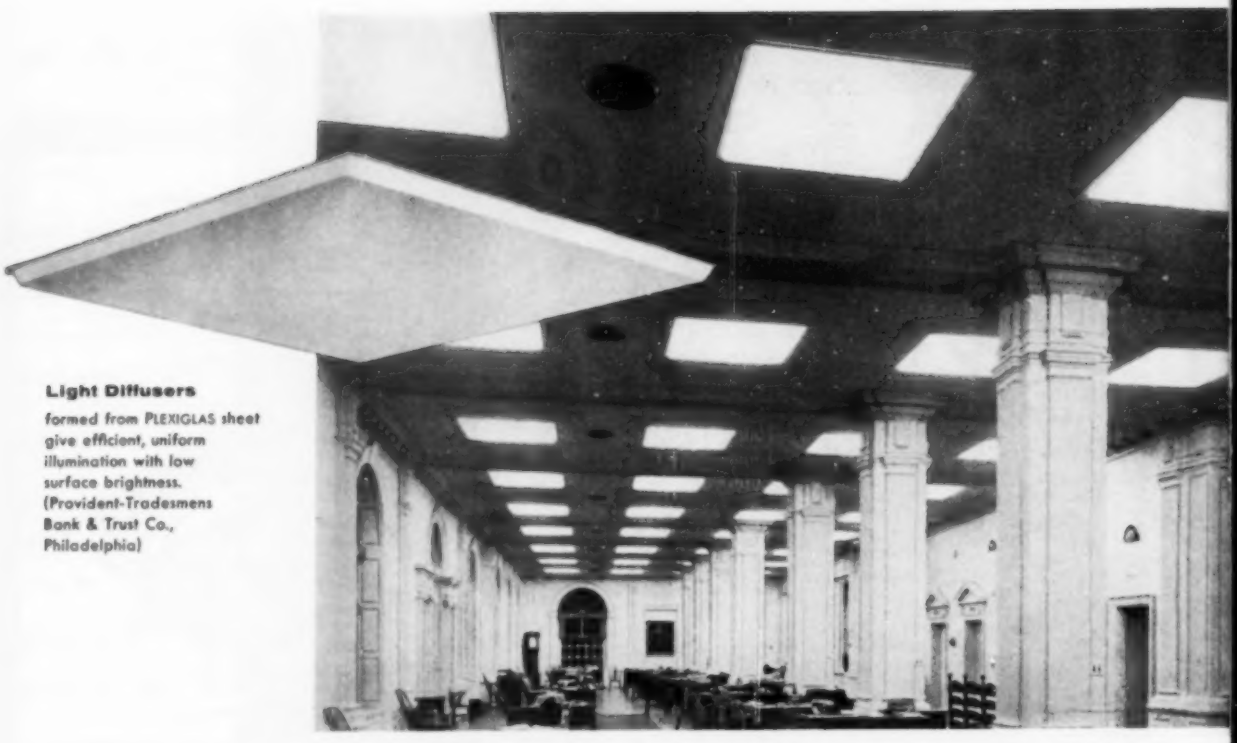
Phoenix Glass Co.
Monaca, Pa. *D. G. Cameron*

Pierce Electric Co.
367 W. Adams St.
Chicago 6, Ill. *John H. Pierce*

Pittsburgh Corning Corp.
Port Allegany, Pa. *Howard F. Kingsbury*

Pittsburgh Plate Glass Co.
Grant Bldg.
Pittsburgh 19, Pa. *R. G. Whittemore*

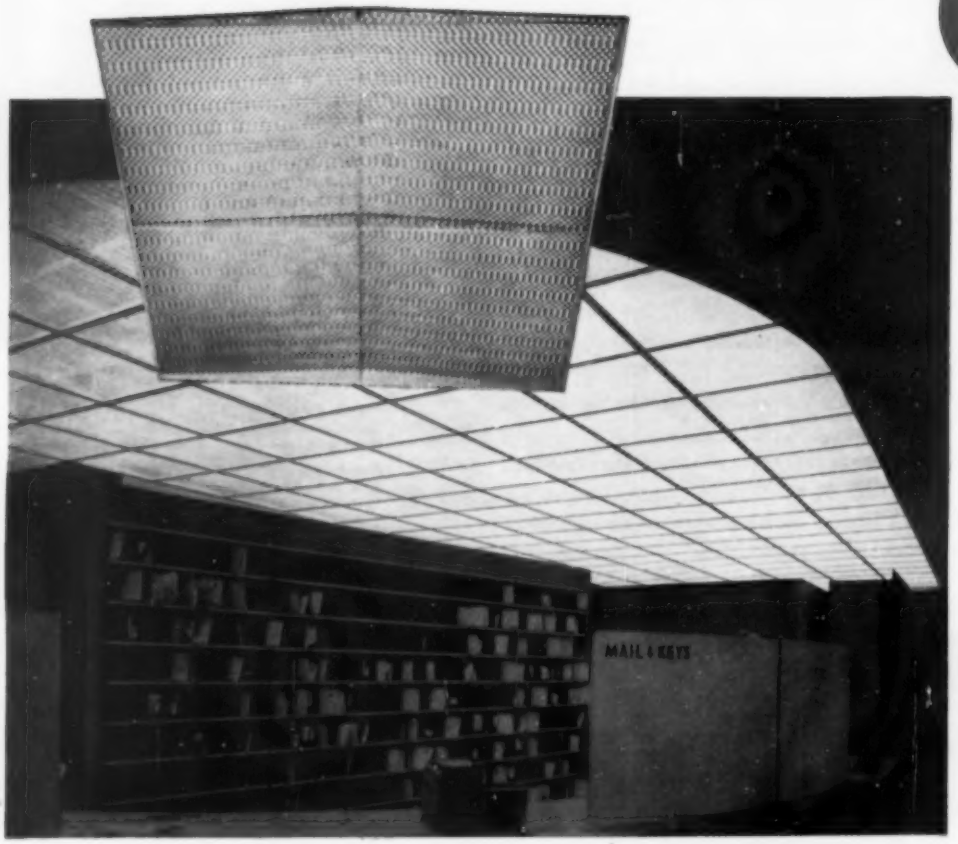
(Continued on page 40A)



Light Diffusers

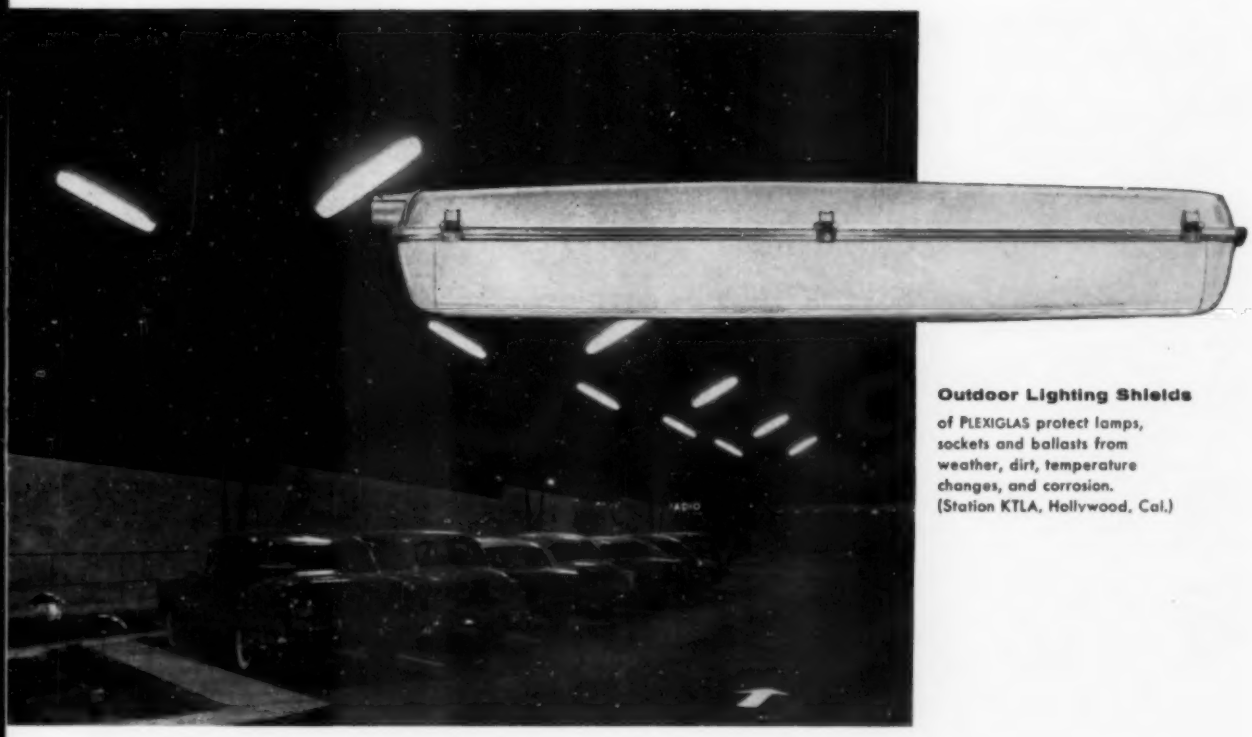
formed from PLEXIGLAS sheet give efficient, uniform illumination with low surface brightness. (Provident-Tradesmens Bank & Trust Co., Philadelphia)

PL



Light Control Lenses

made from PLEXIGLAS molding powder provide a high level of downward light with complete visual comfort, and give beauty and safety overhead. (Hotel Cleveland, Cleveland)



Outdoor Lighting Shields
of PLEXIGLAS protect lamps, sockets and ballasts from weather, dirt, temperature changes, and corrosion. (Station KTLA, Hollywood, Cal.)

EXIGLAS

...answer to almost any lighting problem

Indoors or outdoors . . . wherever light must be transmitted, controlled, diffused or protected . . . you'll find the job being done best by equipment that incorporates PLEXIGLAS® acrylic plastic. Lighting engineers, contractors, architects, and their clients, prefer such equipment because PLEXIGLAS has the following advantages:

. . . **highest efficiency** in light transmission and diffusion
. . . **light weight and strength,** for structural simplicity
. . . **resistance to weather and breakage,** for long life and low maintenance
. . . **economically formed or molded** to almost any shape and size
. . **freedom from discoloration** by fluorescent light

These advantages add up to lighting of the highest quality.
To obtain them, be sure the equipment you select has diffusers, lenses or shields of PLEXIGLAS
For sources of supply, just fill in and mail the coupon below.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay East, Toronto, Ontario, Canada*

ROHM & HAAS COMPANY
Washington Square
Philadelphia 5, Pa.

Please send the names of manufacturers of lighting equipment with PLEXIGLAS ☐ Diffusers, ☐ Light Control Lenses, ☐ Weather Shields.

Name_____

Firm_____

Address_____

(P7-24) City_____ Zone____ State_____

(Continued from page 37A)

Pittsburgh Reflector Co.
403-411 Oliver Bldg.
Pittsburgh 22, Pa. — *R. C. Zimmeister*

Plax Corp.
P. O. Box 1019, Hartford, Conn. — *C. N. Sprankle*

Portland Electric & Plumbing Co.
905 S. W. 16th Ave.
Portland 5, Ore. — *Ned Higgins*

Portland General Electric Co.
Electric Bldg.
Portland 5, Ore. — *T. W. Fitch*

The Potomac Edison Co.
55 E. Washington St.
Hagerstown, Md. — *C. D. Lyon*

Potomac Electric Power Co.
929 E. Street, N. W.
Washington 4, D. C. — *George Bisset*

Powerlite Devices Ltd.
54 Atomic Ave.
Toronto 14, Ont. — *W. L. Hawley*

Prescolite Manufacturing Corp.
2229 Fourth St.
Berkeley 10, Calif. — *W. D. Runswick*

Progressive Products Co. Inc.
6615 Milwaukee Ave.
Chicago 31, Ill. — *E. George Goddard*

Prophylactic Brush Co.
Prolon Plastic Division
Florence, Mass. — *John H. Moore*

Public Service Co. of Colorado
900 15th St.
Denver 1, Colo. — *H. T. Rankin*

Public Service Co. of Indiana Inc.
1000 E. Main St.
Plainfield, Ind. — *Robert McMurray*

Public Service Co. of New Mexico
P. O. Box 1360
Albuquerque, N. M. — *T. F. Douglass*

Public Service Co. of Oklahoma
Box 201, Tulsa, Okla. — *D. J. Frandsen*

Public Service Electric & Gas Co.
80 Park Place, Newark, N. J. — *S. A. Moore*

Puget Sound Power & Light Co.
10608 N. E. 4th St.
Bellevue, Wash. — *Frank McLaughlin*

Pyle National Co.
1334 N. Kostner
Chicago 51, Ill. — *A. G. Voelkner*

Quadrangle Mfg. Co.
32 S. Peoria St.
Chicago 7, Ill. — *D. E. Worrell*

Quebec Hydro-Electric Commission
107 Craig St. W.
Montreal, Que. — *Paul E. Poitras*

Quebec Power Co.
P. O. Box 1607, Quebec, Que. — *Jean Saint-Jaques*

G. A. Rafel & Co.
2112 W. Lawrence
Chicago 25, Ill. — *George A. Rafel*

Rambusch Decorating Co.
40 W. 15th St.
New York 19, N. Y. — *Edward Rambusch*

Revere Electric Mfg. Co.
6009-17 Broadway
Chicago 40, Ill. — *Murray J. Whitfield*

Revere Electric Supply Co.
2501 W. Washington Blvd.
Chicago 12, Ill. — *Arthur Peterson*

Ritter Co., Inc.
400 West Ave.
Rochester 3, N. Y. — *Horace W. Alexander*

Robert Manufacturing Co. Inc.
99 Dell Glen Ave.
Lodi, N. J. — *Robert Geissenberger*

Rochester Gas & Electric Corp.
89 East Ave.
Rochester 4, N. Y. — *L. C. Twichell*

Rockland Light & Power Co.
Nyack, N. Y. — *D. S. Schaab*

Rohm & Haas Co.
222 W. Washington St.
Philadelphia 5, Pa. — *H. A. Williams*

Rosemount Industries Ltd.
2090 Moreau St.
Montreal, Que. — *Paul A. Ducasse*

Ruby Lighting Corp.
2869 W. Olympic Blvd.
Los Angeles, Calif. — *Milton Weiner*

Rumsey Electric Co.
1007 Arch St.
Philadelphia 7, Pa. — *T. W. Lauer*

Jas. E. Rust Electric Co., Inc.
1511 W. Jackson Blvd.
Chicago 7, Ill. — *Earl C. Heller*

Sachs Electric Corp.
5540 W. Park
St. Louis, Mo. — *Louis Sachs*

The Safety Car Heating & Lighting Co., Inc.
P. O. Box 70, Milford, Conn. — *H. W. Jones, Jr.*

St. Joseph Light & Power Co.
520 Francis St.
St. Joseph 2, Mo. — *F. P. O'Connor*

Sandel Manufacturing Co.
3618 S. Loomis Place
Chicago 9, Ill. — *A. L. Sandel*

San Diego Gas & Electric Co.
P. O. Box 1831
San Diego 12, Calif. — *H. G. Dillin*

Saskatchewan Power Corp.
1739 Cornwall St.
Regina, Sask. — *W. B. Clipsham*

Savannah Electric & Power Co.
Savannah, Ga. — *J. L. Davidson*

Service Electric Co.
8345 South Ashland
Chicago, Ill. — *Harold Zwitt*

S. F. Lighting & Supply Co.
1147 Howard St.
San Francisco, Calif. — *Russell Virgil*

Shalda Manufacturing Co. Inc.
156 W. Providence
Burbank, Calif. — *William Shalda*

Shawinigan Water & Power Co.
600 Dorchester St. W., P. O. Box 6072
Montreal, Que. — *Chas. H. Talbot*

The Sherwin-Williams Co.
101 Prospect Ave. N. W.
Cleveland 1, Ohio — *J. A. Meacham*

Silvray Lighting, Inc.
R.K.O. Bldg., Radio City
New York 20, N. Y. — *J. M. Gilbert*

Smithcraft Lighting Division
A. L. Smith Iron Co.
217 Everett Ave.
Chelsea 50, Mass. — *Hugh M. Nazor*

Smoot-Holman Co.
P. O. Box 4097
Inglewood, Calif. — *L. A. Hobbs*

Sola Electric Co.
4633 W. 16th St.
Chicago 50, Ill. — *L. C. Marschall*

Solar Light Mfg. Co.
400 N. Ashland Ave.
Chicago 22, Ill. — *Bernard Lazerson*

Solux Corp.
58-17 28th Ave.
Woodside 77, N. Y. — *A. E. Spinetta*

Southern California Edison Co.
601 W. Fifth St.
Los Angeles 53, Calif. — *Roy E. Dahlin*

Southern Canada Power Co. Ltd.
355 St. James St. W.
Montreal, Que. — *M. A. Perry*

Southern Colorado Power Co.
Box 75, Pueblo, Colo. — *E. H. Pemberton*

Southern Indiana Gas & Electric Co.
P. O. Box 569
Evansville, Ind. — *C. K. Graham*

Southern Lighting Mfg. Co.
501 Elwell St.
Orlando, Fla. — *Max K. Aulick*

Southwestern Gas & Electric Co.
Box 1106, Shreveport, La. — *E. F. Graham*

Southwestern Public Service Co.
P. O. Box 1261
Amarillo, Texas — *A. R. Watson*

The Spero Electric Corp.
20500 St. Clair Ave.
Cleveland 17, Ohio — *Manny Spero*

Standard Electric Co.
175 S. Saginaw St.
Pontiac, Mich. — *Abe Cohen*

Standard Mfg. Corp.
1100 S. Central Park Ave.
Chicago, Ill. — *Elliott Tarson*

Stanley Electric Mfg. Co.
3700 S. 80th St.
Philadelphia, Pa. — *Bernard S. Heller*

The Starbuck Sprague Co.
59 Spring St.
Waterbury, Conn. — *E. A. Madison*

Starring & Co. Inc.
1600 Seaview Ave.
Bridgeport, Conn. — *Carl E. Paul, Jr.*

Steber Manufacturing Co.
2700 Roosevelt Rd.
Broadview, Ill. — *Robert J. Besal*

Steel Craft Fluorescent & Stamping Co.
191 Murray St.
Newark 5, N. J. — *Arthur Meister*

Steel Window Institute
Cheltenham, Pa. — *George Hingston*

Sterling Reflector & Mfg. Co.
3249 West Grand Ave.
Chicago 51, Ill. — *Anton Oberhuber*

Sticklor Electric Supply Co.
346 Ann St.
Hartford 3, Conn. — *Marshall Sticklor*

Stonco Electric Products Co.
333 Monroe Ave.
Kenilworth, N. J. — *H. W. Spence*

Suburban Electric Co.
157 Pleasant St.
Malden, Mass. — *Warren K. Lewellen*

Sunbeam Lighting Co.
777 E. 14th Place
Los Angeles 11, Calif. — *Herbert L. Krieger*

Sun-Lite Manufacturing Co.
2555 Bellevue Ave.
Detroit 7, Mich. — *Fred Binder*

Sun-Ray Fluorescent Co.
2025 So. Michigan Ave.
Chicago, Ill. — *Jerome Gimbel*

Super Electric Construction Co.
4300 W. Chicago Ave.
Chicago 51, Ill. — *P. M. Pavesich*

The Superior Electric Co.
83 Laurel St.
Bristol, Conn. — *William P. Carpenter*

Supreme Lighting Co.
600 Turner St.
Los Angeles 12, Calif. — *J. Shapiro*

Sylvania Electric Products Inc.
1740 Broadway
New York 19, N. Y. — *D. P. Caverly*

Sylvania Electric (Canada) Ltd.
Suite 522, University Tower Bldg.
Montreal, Que. — *F. W. Fulle*

Tampa Electric Co.
Cass & Tampa Sts.
Tampa 1, Fla. — *W. C. MacInnes*

Tarnow Electric Supply Co.
45 E. Milwaukee Ave.
Detroit, Mich. — *Nathan Tarnow*

Frank C. Teal Co.
3222-24 E. Jefferson
Detroit 7, Mich. — *Harold C. Smith*

(Continued on page 42A)

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

HERE . . . MEANS BETTER SEEING HERE

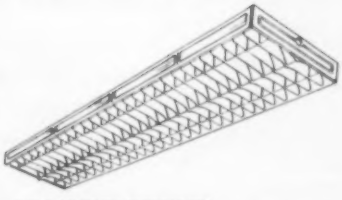
Day-Brite Plexoline® fixtures help attract customers, display merchandise, stimulate buying and guide traffic in Jackson's Department Store, Coral Gables, Fla.

When sales are at stake...be Day-Brite sure!

About 85% of all impulse buying depends on the *eye appeal* of merchandise. If better seeing is this important to *your* client, don't compromise on lighting. Always specify Day-Brite—the nation's first choice in lighting fixtures. For proof of Day-Brite superiority, make your own comparison.

Day-Brite Lighting, Inc., 5432 Bulwer Ave., St. Louis 7, Missouri. Day-Brite Lighting, Inc., of California, 530 Martin Ave., Santa Clara, California.

71183



THE DAY-BRITE PLEXOLINE®
Handsome. Versatile. Economical. Ribbed plastic side panels and louvered bottoms. Available in 2- or 4-lamp units, in 4-foot and 8-foot lengths for Rapid Start and Slimline lamps. Hot-bonded enamel finish.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

AND INDUSTRIAL LIGHTING EQUIPMENT

SUSTAINING MEMBERS

(*Continued from page 40A*)

Terreau-Racine Ltee.
196-228 St. Paul St.
Quebec, Que. *Georges Langlais*

Texas Electric Service Co.
Electric Bldg., Ft. Worth 1, Texas *O. G. Carlson*

Texas Power and Light Co.
P. O. Box 6331
Dallas 22, Texas *Bassett Watson*

Thompson Electric Co.
1111 Power Ave.
Cleveland 14, Ohio *Robert K. Farrington*

Toledo Edison Co.
Edison Bldg., Toledo 4, Ohio *John K. Davis*

Toledo Electrical Contractors Association, Inc.
216 Secor Hotel
Toledo 4, Ohio *Clarence F. Hammer*

Toronto Hydro-Electric System
14 Carlton St.
Toronto 2, Ont. *Wilson J. Wylie*

B. M. Tower Co., Inc.
Dewey St., Bridgeport, Conn. *Harvey N. Tower*

Tri-Part Mfg. Co.
934 Plum St., Detroit 1, Mich. *Julius Reznik*

Underwriters Laboratories, Inc.
207 E. Ohio St.
Chicago 11, Ill. *Fred Neumer*

Union Electric Co.
315 N. 12th Blvd.
St. Louis 1, Mo. *Merrill E. Skinner*

Union Metal Mfg. Co.
Canton 5, Ohio *W. A. Porterfield*

Unistrut Corp.
4118 Monroe Ave.
Wayne, Mich. *Hugo E. Rebentisch*

Unistrut Products Co.
1013 W. Washington Blvd.
Chicago 7, Ill. *George W. Butler*

The United Illuminating Co.
80 Temple St.
New Haven 6, Conn. *E. B. Haskell*

Universal Mfg. Corp.
29-51 E. 6th St.
Paterson, N. J. *Imrich Miller*

Utah Power & Light Co.
Box 899, Salt Lake City 10, Utah *W. A. Huckins*

John C. Virden Co.
6009-6103 Longfellow Ave.
Cleveland 3, Ohio *John C. Virden, Jr.*

John C. Virden Ltd.
19 Curity Ave.
Toronto 13, Ont. *P. G. Kirkpatrick*

Virginia Electric & Power Co.
Richmond 9, Va. *W. I. Dolbeare*

Voight Company
1634-38 N. Carlisle St.
Philadelphia 21, Pa. *C. J. Frank*

Voltarc Tubes, Inc.
44 Cross St., Norwalk, Conn. *Wallace G. Hill*

Wadeford Electric Co.
205 W. Wacker Dr.
Chicago 6, Ill. *H. H. Lundberg*

The Wakefield Co.
Vermilion, Ohio *A. F. Wakefield*

Wald & Zigas
42-40 27th St.
Long Island City, N. Y. *Henry J. Wald*

Warren Electric Co.
P. O. Box 2594
Houston, Texas *J. R. Thompson*

Wasco Products Inc.
Bay State Rd.
Cambridge 38, Mass. *M. C. Kirkpatrick*

The Washington Water Power Co.
P. O. Drawer 1445
Spokane 6, Wash. *Gordon F. DeFoe*

Webb Electric Mfg. Co.
1701 S. W. Jefferson St.
Portland 1, Ore. *F. E. Webb*

Welsbach Engineering and Management Corp.
1500 Walnut St.
Philadelphia 2, Pa. *H. H. Adams*

Westinghouse Electric Corp., Lamp Division
Bloomfield, N. J. *Marshall N. Waterman*

Westinghouse Electric Corp.
1216 W. 58th St.
Cleveland 2, Ohio *E. C. Huerkamp*

Westinghouse Electric Supply Co.
3 Gateway Center, P. O. Box 448
Pittsburgh 30, Pa. *Harold J. Lutton*

West Penn Power Co.
Cabin Hill, Greensberg, Pa. *R. G. MacDonald*

Wheeler Reflector Co.
275 Congress St.
Boston 10, Mass. *Harlan B. Fletcher*

Wheeling Electric Co.
51 Sixteenth St.
Wheeling, W. Va. *M. J. Barth*

White Way Electric Sign & Maintenance Co.
1317 Clybourn Ave.
Chicago 10, Ill. *Martin Davis*

Wholesale Electrical Supply Co.
7333 Cottage Grove Ave.
Chicago 19, Ill. *Raymond D. Arenberg*

Wiedenbach-Brown Co. Inc.
111 Eighth Ave.
New York 11, N. Y. *W. C. Stockberger*

Wigdahl Electric Co.
4246-48 Milwaukee Ave.
Chicago 41, Ill. *T. J. Wigdahl*

R & W Wiley Inc.
119 Dearborn St.
Buffalo 7, N. Y. *Robert C. Graves*

H. E. Williams Products Co.
108 S. Main St.
Carthage, Mo. *F. B. Williams, Jr.*

Wilmot Castle Co.
P. O. Box 629
Rochester 2, N. Y. *E. H. Greppin*

Wilson Electrical Equipment Co.
P. O. Box 1725
Houston, Texas *Dallas L. Calmes*

J. A. Wilson Lighting & Display Ltd.
280 Lakeshore Rd.
Toronto, Ont. *J. A. Wilson*

The Windsor Utilities Commission
Hydro Division
149 Chatham St. W.
Windsor, Ont. *Henry R. Soutar*

The Wiremold Co.
Hartford 10, Conn. *Robert H. Murphy*

Wisconsin Electric Power Co.
Public Service Bldg.
Milwaukee 1, Wis. *G. W. Van Derzee*

Wisconsin Power & Light Co.
122 W. Washington Ave.
Madison 1, Wis. *M. R. Norton*

Wisconsin Public Service Corp.
Green Bay, Wis. *A. G. Bur*

Worcester County Electric Co.
939 Southbridge St.
Worcester 3, Mass. *Donald S. Bennett*

Work-O-Lite Co.
522 Cortlandt St.
Belleville, N. J. *Jack Siegel*

Wright Light, Inc.
2924 Commerce St., P. O. Box 4155
Houston, Texas *Merrill C. Wright*

Zenith Electric Supply Ltd.
185 Bridgeland Ave.
Toronto 10, Ont. *B. R. Steen*

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I.E.S. FELLOWS

(*Continued from page 26A*)

WATERMAN, MARSHALL N. (1956), Westinghouse Electric Corp., Bloomfield, N. J.

NORTH TEXAS SECTION

FOLSOM, WILLIAM E. (1952), Dallas Power & Light Co., 1506 Commerce St., Dallas 1, Texas.

OETTING, ROBERT L. (1954), General Electric Co., 6500 Spring Road, Dallas, Texas.

PALMETTO CHAPTER

REX, C. H. (1954), General Electric Co., Hendersonville, N. C.

PHILADELPHIA SECTION

BRAINERD, ARTHUR A. (1946), Star Route, Erwinna, Pa.

HALLMAN, ERIC B. (1953), Electric Service Mfg. Co., 17th & Cambria Sts., Philadelphia, Pa.

HOLMES, P. R. (1946), General Electric Co., 3 Penn Center Plaza, Philadelphia 2, Pa.

SHOEMAKER, GEORGE E. (1953), Philadelphia Electric Co., 211 S. Broad St., Philadelphia, Pa.

WESTERMAIER, FRANCIS V. (1945), 400 King's Highway East, Haddonfield, N. J.

PITTSBURGH SECTION

Slauer, Richard G. (1949), Sylvania Electric Products, Inc., One 48th St., Wheeling, W. Va.

ROCHESTER SECTION

EVANS, RALPH M. (1953), Eastman Kodak Co., 65 Kodak Park, Rochester 4, N. Y.

ROCKY MOUNTAIN SECTION

McCULLOCH, JAMES H. (1957), Independent Testing Laboratories, 1928 14th St., Boulder, Colo.

ST. LOUIS SECTION

AMICK, CHARLES L. (1955), Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis 7, Mo.

LEWIS, CARTER (1955), Union Electric Co., 315 No. 12th St., St. Louis 1, Mo.

SAN DIEGO SECTION

ROLPH, THOMAS W. (1945), 142 N. 2nd Ave., Chula Vista, Calif.

SAN JOSE CHAPTER

BROWN, LELAND H. (1945), Illumination Laboratory, Stanford, Calif.

SOUTHERN CALIFORNIA SECTION

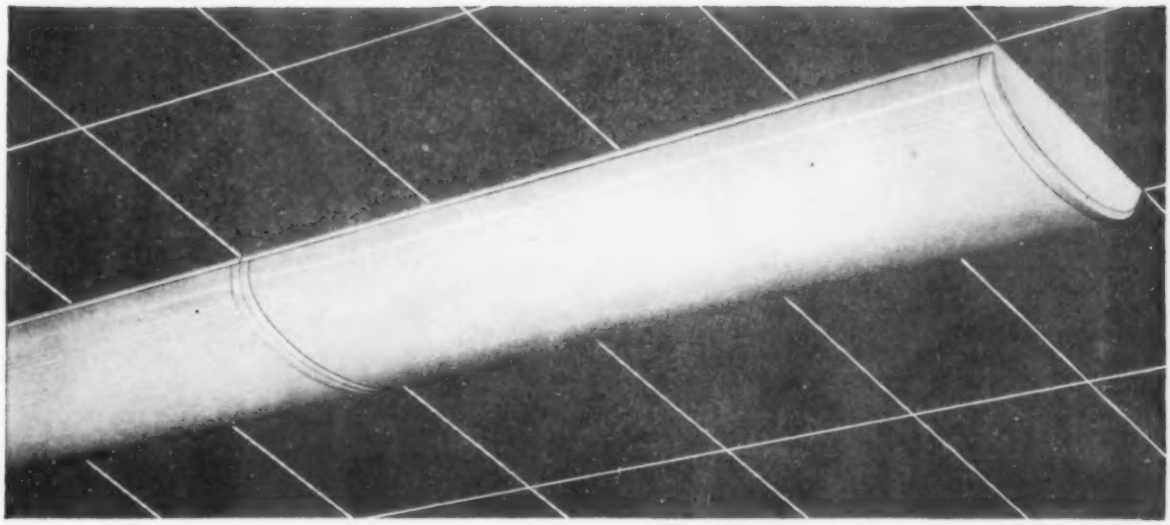
BOELTER, LLEWELLYN M. K. (1948), University of California, Dept. of Engineering, Los Angeles 24, Calif.

GIBSON, CHARLES D. (1955), Bureau of School Planning, California State Dept. of Education, 1100 S. Grand Ave., Los Angeles 12, Calif.

(*Continued on page 60A*)

"Built-In" look...

Surface-Mounted Cost



GARCY Ultra-Lux . . . shallow, plastic enclosed fixture . . . ideal for low ceiling lighting

Minimum depth consistent with good light distribution and brightness control

With curved shield, unit is only 3¼" at its deepest point . . . yet surface brightness is virtually uniform at all viewing angles and well within acceptable limits for glare-free comfort.

Improved light-stable extruded plastic guaranteed not to warp or discolor

Shield is of Koppers improved EVENGLO*, a premium-grade polystyrene with built-in resistance to discoloration caused by ultra-violet radiation of fluorescent lamps.

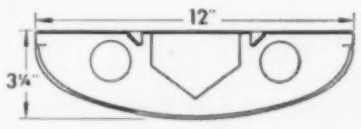
*EVENGLO is a registered trade mark of Koppers Company, Inc.

Easy to install . . . only two basic parts

Completely assembled chassis with integral end plates is lightweight, sturdy, easy to handle. Separately cartoned one-piece shield hooks on after installation.

Easily cleaned . . . no need to remove shield from fixture

Curved shield is invisibly framed and hinged . . . lets down at a touch, wipes clean in seconds.



GARCY
Preferred for Performance
COMPLETE COMMERCIAL LIGHTING

Garcy offers a complete line of lighting fixtures for commercial, institutional and display lighting.

Garden City Plating and Manufacturing Company
1760 North Ashland Avenue • Chicago 22, Illinois
In Canada: Garcy of Canada, Ltd., 1244 Dufferin Street, Toronto 4

This luminous ceiling solved many problems. The room was made to seem larger by the curved shape. Outlets for concealed air conditioning system were provided in the wide dividing strips, while return air plenums are located at the sides. Note evenness of lighting. Designed by Eleanor LeMaire for Manufacturers Trust Co., both of N.Y.C. Manufactured by Luminous Ceilings, Inc., Chicago.

Made easy with BAKELITE Rigid Vinyl Sheet...

A "floating" umbrella of light

Striking solution for a modernization problem! Irregularity of walls and windows would have required an elaborate fitting job. By "floating" a luminous ceiling between the walls, standard units in a standard module could be used.

The ceiling is constructed with panels made of BAKELITE Brand Rigid Vinyl Sheet, their light weight being of great importance in the installation of this high ceiling. In themselves, the panels require little attention, being resistant to moisture, corrosion, cracking and warping.

Now... find out more about illuminated ceilings with translucent panels of BAKELITE Rigid Vinyl Sheet. In new construction or remodeling, it throws new light on lighting problems. Write Dept. ZM-82.

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N.Y.

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for the critical lighting professional

Recessed Incandescent Domes

QUADRILITE by LIGHTOLIER

Quadrilite is the ideal lighting solution for stores, offices, showrooms and public areas where you require a combination of controlled downlight and diffused illumination. Two foot squares are planned for individual, pattern or continuous run mountings. The graceful star centerpiece is punctuated by a Colouvered® lens, with ceramic-tinted risers, which directs controlled, glare-free illumination downward. Diffused light radiates from the broad white recessed dome. Engineered for swift, simple installation into many of the popular new suspended 2' x 4' acoustical ceilings or, of course, into plaster. Takes economical general service lamps. Available in two foot squares or 30" round units. For complete data, write to: Jersey City 5, New Jersey or see the authorized distributors listed on this page.

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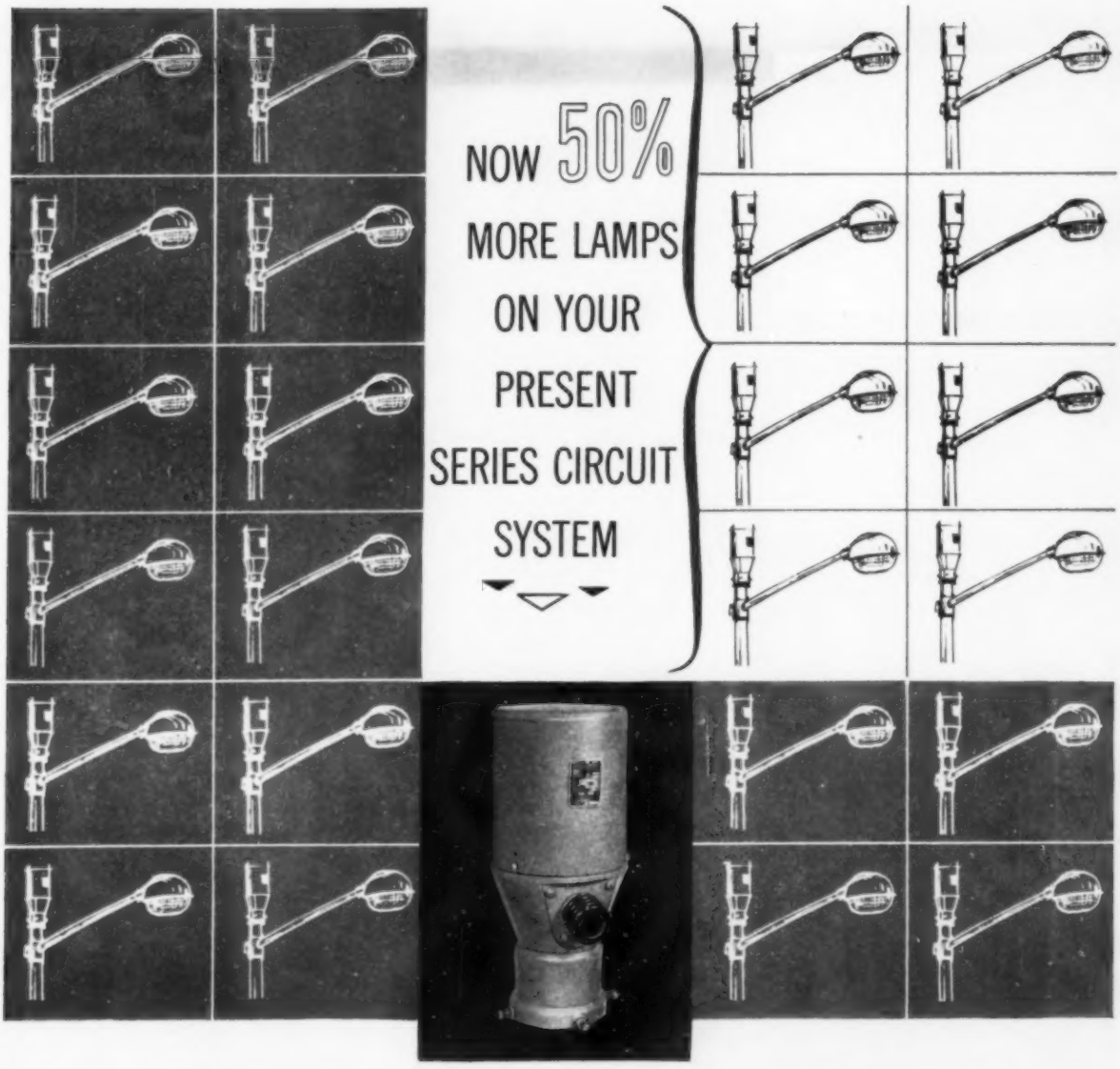


NEW JEFFERSON UNITY POWER FACTOR TRANSFORMERS
require 33% LESS REGULATOR CAPACITY

Here is equipment never before available for street lighting application. Coupled with the "new concept" of low reactance isolating transformers, these Jefferson transformers make possible a 50% increase in lamps per constant current regulator. Each lamp requires 33% *less* regulator capacity.

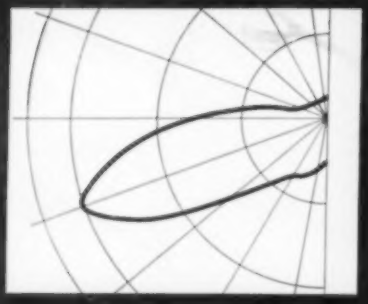
Now present systems can be increased, using an H-1 lamp for example, from 15 to 22 lamps, with your *present* constant current regulator.

This latest Jefferson development gives you bigger savings in installation, wiring, time and money. Write today for folder describing these new transformers.

These new transformers have the exclusive Aqualift Sealant which seals out all moisture and cuts installation time

Jefferson MERCURY LAMP TRANSFORMERS

JEFFERSON ELECTRIC COMPANY • BELLWOOD, ILLINOIS



MAN has extended his pleasure, safety and comfort through control of light. Glass provides the medium necessary for such control. You will find both glass and knowledge to fit *your* lighting task at Corning.

Inquiries invited and welcomed.

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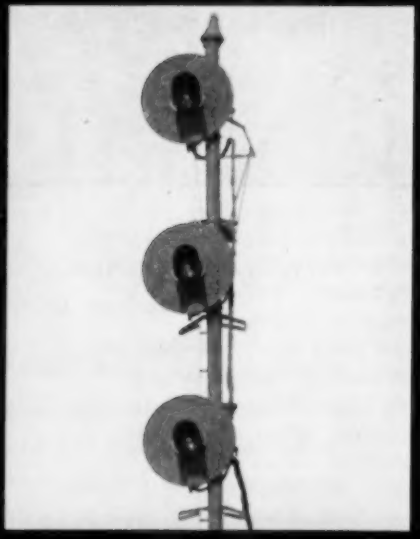

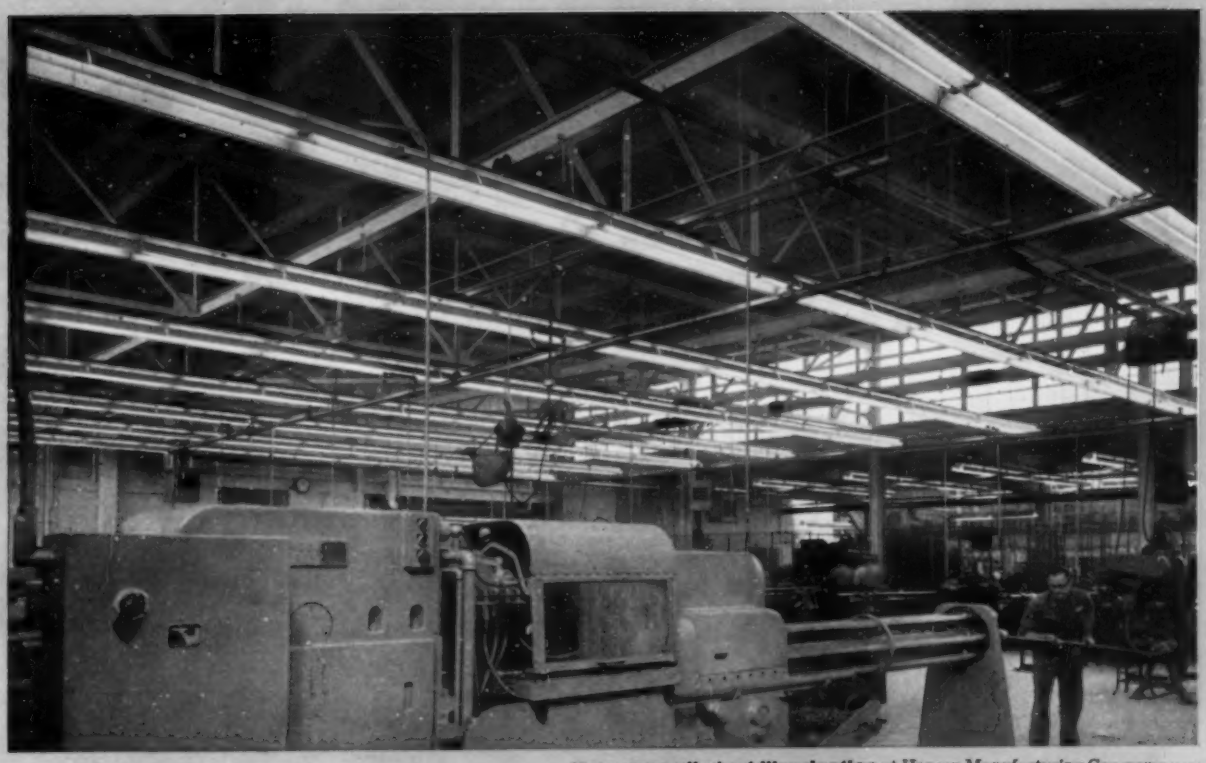

New over-all plant illumination at Hansen Manufacturing Company uses Sylvania Diamond-"I" fixtures, eliminates need for supplementary lighting.

How they get around the high cost of supplementary lighting

. . . at Hansen Manufacturing Company

"The convenience, higher efficiency and increased comfort of this modern fluorescent lighting system . . . make this type of lamp-reflector combination the coming thing in industry."

Hansen Manufacturing Company (Cleveland, Ohio), precision manufacturers of quick-connective fluid couplings for industry, learned from experience: "*Special lighting fixtures cost money to operate and maintain, and get in the way, at work locations.*"

So Hansen did away with supplementary lighting—even in precision-work areas—by installing Sylvania Diamond-"I" fixtures throughout their new plant addition. These slotted semi-direct units have a full 25% upward light component. This builds illumination efficiency up to an extremely high 89%, gives the high foot-candle levels needed. It softens harsh overhead contrasts, and shadow and glare spots, at "*see*" level.

Ultimate in Lighting Design

Except in a few spots where overhead shielding interferes, *the higher light ratios at machine level eliminate need for supplementary lighting fixtures.* Fine printing on micrometers is clearly visible. Breaks caused by metal failures can be spotted promptly, often saving expensive tools.

William B. Ferguson, consulting electrical engineer on the job, reports, "The 25% uplight provided is considered the ultimate in design, alleviating a great deal of discomfort."

Valuable Data for You

Our advice: Don't buy plant lighting until you know about all its physical characteristics—quantity, quality, brightness ratios, shadow, glare, maintenance factors, efficiency, etc. Our new 24-page book, *Prescribed Lighting Protects the Eyes of Industry*, gives you the data you need—simply, quickly. Write today for your *free* copy.

Sylvania Electric Products Inc.
Dept. J-30, Lighting Fixtures
One 48th Street, Wheeling, W. Va.

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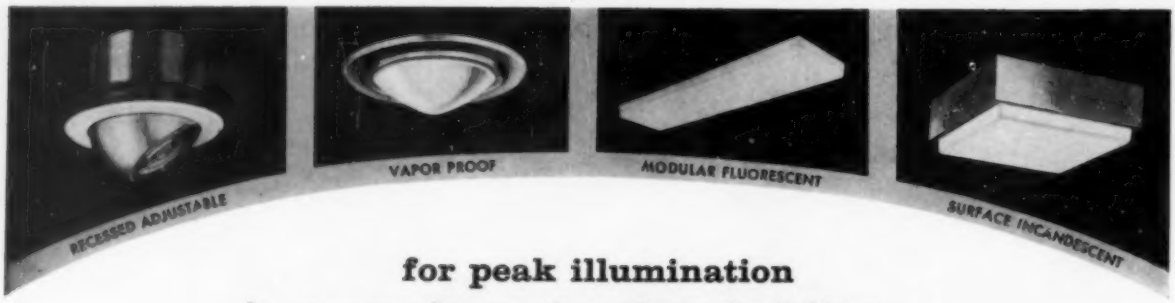
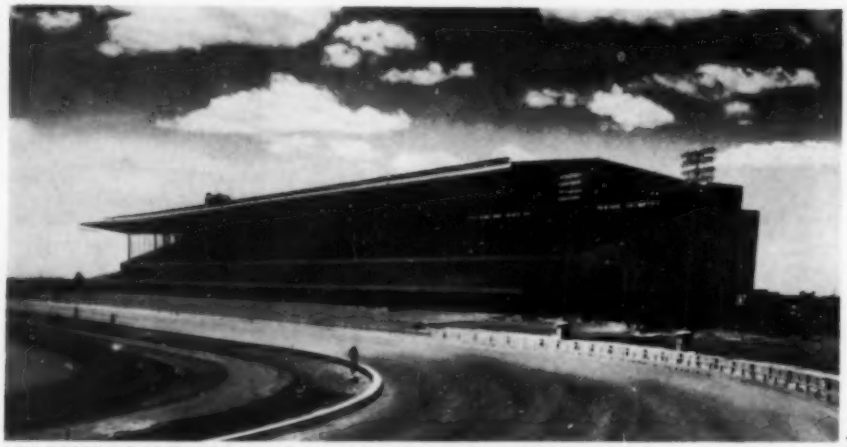
. . . fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY



for peak illumination
in every phase of modern building . . .

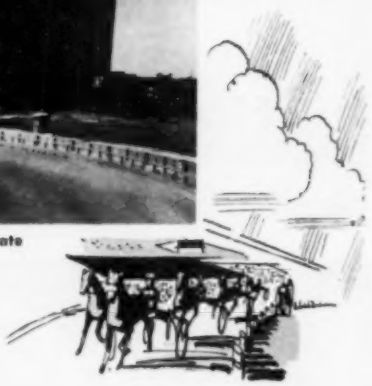
Lighting By
LITECRAFT



NEW ROOSEVELT RACEWAY in Westbury, L. I. — proves once again our consummate skill in lighting engineering and design

architect: **Skidmore, Owings & Merrill**

electrical contractors: *(a joint venture)* **Fischbach & Moore, Inc., J. Livingston & Co.**



When specifications call for the extra elements of imagination and interpretive planning, as well as the expected elements of skill and precision, more and more specifiers turn to Litecraft. Our experience and reputation are *your* guarantee of successful installations regardless of job size or particular lighting problems.

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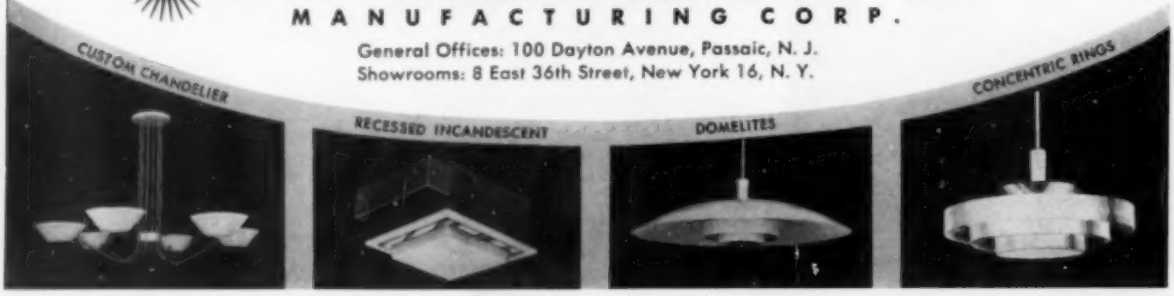


IT'S A SNAP!... to install PITTSBURGH'S NEW "SEE-WAY" LUMINAIRE

GENERAL CHARACTERISTICS

The SEE-WAY is an All-White 2-lamp direct-indirect luminaire for surface or pendant mounting. It's made of highest quality electrical components. All parts are die-formed of 20-gauge sheet steel; prefinished by the Parker Bonderite iron phosphate process for corrosion resistance. Comes in 4 and 8 foot sections.

PLASTIC SIDE PANELS "SNAP" INTO PLACE

Here is a brand new feature that will save many hours of installation time . . . and greatly simplify panel removal for cleaning or replacement.

Side panels are flexible diffusing ribbed polystyrene . . . easy to handle, ship, and maintain. Light in weight, they reduce the ceiling load appreciably. They also add to the appearance and overall efficiency of the unit.

The light from the See-Way is glare-free, comfortable, easy to work under. Perfect for classrooms, offices, or wherever visual comfort is necessary to maintain peak working efficiency over long periods.

See-Way's low cost makes it easy on the budget too!

For other advantages on the SEE-WAY you ought to know about,

WRITE FOR BULLETIN M-11.

PITTSBURGH REFLECTOR COMPANY

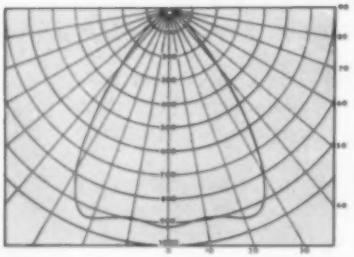
411 OLIVER BUILDING, PITTSBURGH 22, PA.

Lighting Engineers in All Principal Cities

PITTSBURGH LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

now . . . in a Prismatic Lens

glare
from the light source
virtually eliminated



Test data by Electrical Testing Laboratories, Inc.

Directo-Lens provides extremely accurate control of light distribution, with reduced-brightness measurements in critical zones.

Features: higher intensities in useful zones, greater eye comfort in critical visual range, sinusoidal wave system of breaking up brightness patterns.

Walter Dorwin Teague Associates designed this improved prismatic lens and suggested reflectors. *Write for Directo-Lens bulletin and photometric data.*

PHOENIX

directo-lens

THE PHOENIX GLASS COMPANY

MONACA, PENNSYLVANIA

NEW YORK • LOS ANGELES • CHICAGO • ATLANTA • DALLAS • WINNIPEG

Revere Outdoor Lighting Report

A timely discussion of an outdoor lighting problem and its solution, prepared for lighting engineers, lighting planners, and architects who may have similar outdoor lighting problems.

Lighting Chicago's "Auto World" Super Service Station

This unique new service station features an auto accessory store and "Speed-Kleen" car wash in addition to its regular auto services. The lighting installation had to be a "standout" to keep pace with this advanced station design.

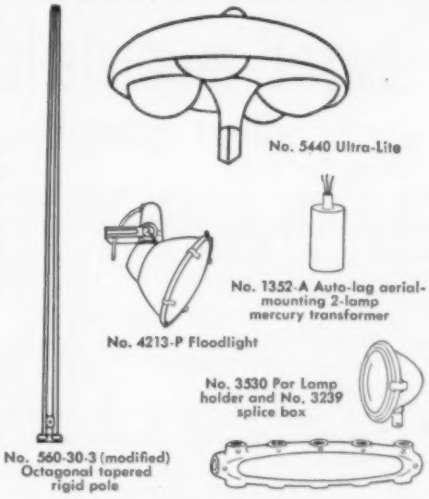
The Problem: To provide outstanding lighting for this unique super service station, so that it could compete favorably for night business with locations on the other three corners of this busy Chicago area intersection.

The Answer: Revere Ultra-Lites for service area lighting, with Revere floodlights for perimeter lighting.

Total service area of "Auto World" installation measures slightly under 10,000 square feet. Service area illumination is approximately 25 foot candles, average, with a ratio of about 2 to 1 overall. This level of illumination with its striking effect, was achieved with 9 Revere Ultra-Lites mounted on 24 foot standards. Perimeter lighting called for 4 standards, each standard mounting 3 Revere "4200" series floodlights. Clusters of 4 par lamp holders were mounted midway on three standards, beamed at the front of the building to emphasize functional detail.

The unusual degree of light uniformity at grade level is due to the pattern thrown by Ultra-Lites. Each Ultra-Lite luminaire is equipped with four 400-watt E-H1 mercury lamps. The controlled beam from the street lighting refractor produces a good shielding angle with high utilization and a square pattern of light.

Revere components used in "Auto World" installation


No. 5440 Ultra-Lite
No. 1352-A Auto-lag aerial-mounting 2-lamp mercury transformer
No. 4213-P Floodlight
No. 3530 Par Lamp holder and No. 3239 splice box
No. 560-30-3 (modified) Octagonal tapered rigid pole

This installation was planned by Revere lighting engineers, selecting the most appropriate lighting combination from Revere's wide group of outdoor lighting fixtures and fittings. No matter what the lighting problem — if it's outdoors, Revere has the equipment, or can engineer it, to provide your best lighting answer.

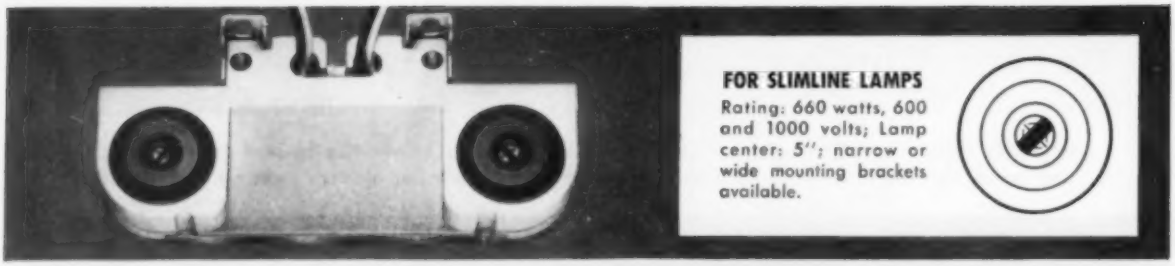
Revere ELECTRIC MFG. CO.

Write for catalog covering Revere's complete line of matched outdoor lighting equipment

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill., UPtown 8-7100

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

OUTDOOR LIGHTING: Industrial • Commercial • Service Stations • Streets • Sports • Airports • Shopping Centers



FOR SLIMLINE LAMPS
Rating: 660 watts, 600 and 1000 volts; Lamp center: 5″; narrow or wide mounting brackets available.

FOR BI-PIN LAMPS
Rating: 660 watts, 600 volts; Lamp center: 5″; narrow or wide mounting brackets available.

FOR HIGH OUTPUT LAMPS
Rating: 660 watts, 600 volts; Lamp center: 5″; narrow or wide mounting brackets available.

Revolutionary new design of turret* multiple lampholders with plastic bodies

GIVES IMPROVED PERFORMANCE AT LOWER COST

This new family of General Electric plastic turret* lampholders for rapid start bi-pin, slimline and high-output lamps offers many improvements in fixture and lampholder design.

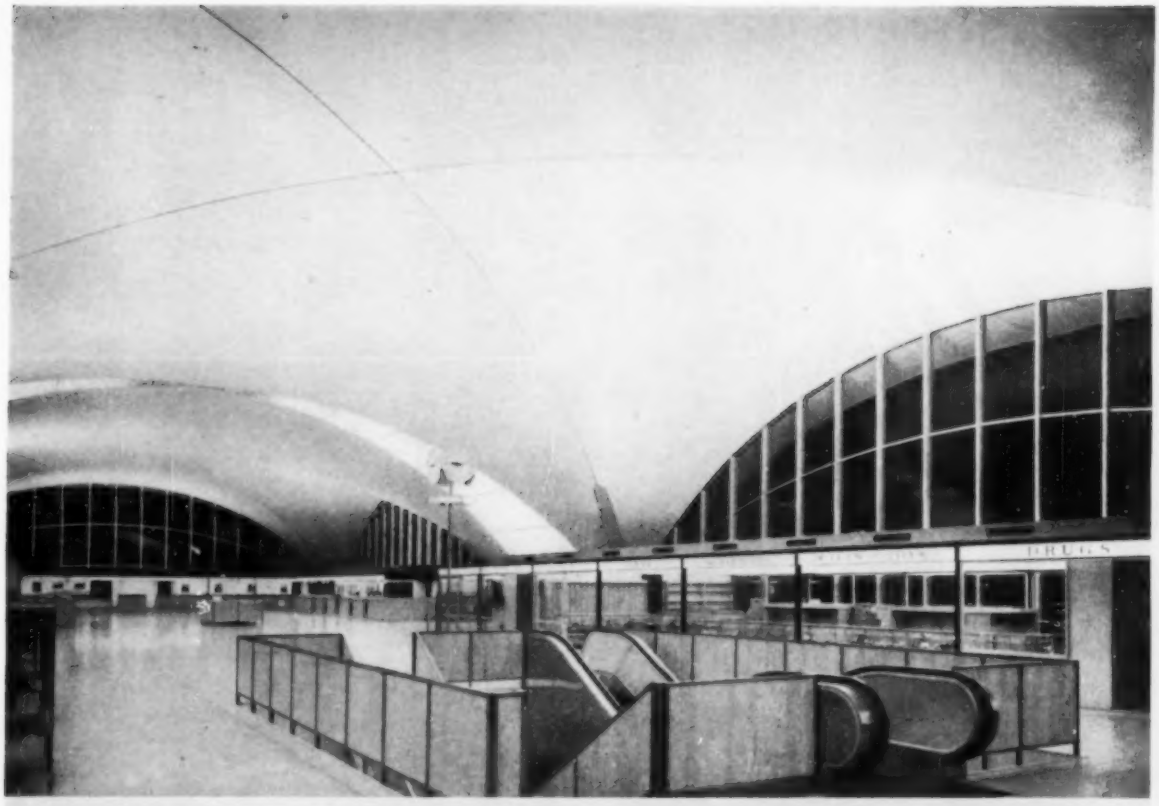
- ✓ Plastic turret body eliminates corrosion that may occur with metal bodies.
- ✓ New narrow brackets allow narrow channels to give the degree of up-lighting desired for many installations.
- ✓ New simplified socket mechanism provides easier, smoother lamp insertion.
- ✓ New slanted front cuts down the dark area between fixtures, and gives maximum light diffusion at the lamp ends.
- ✓ The leads from the sockets are kept separate through the use of individual lead-in holes for each set for easier wiring installation.
- ✓ All springs are made of stainless steel for maximum corrosion resistance.

These new plastic lampholders are also available with wide mounting brackets allowing interchangeability with old style lampholders. For complete information write: Accessory Equipment Department, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC



St. Louis Municipal Airport Terminal Building

Hellmuth, Yamasaki & Leinweber, Architects
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Roberts & Schaefer, Dome Consultants

• 110KW in color corrected mercury lamps, neatly concealed, produce this masterpiece of comfortable indirect light. Not an installation in America like it!...There are 100 Rambusch Field Representatives. One of them is near you and anxious to serve.

RAMBUSCH DESIGNERS • MANUFACTURERS
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Kopp Flying Glassware

keeps pace with expanding air travel

"Can we depend on the glass?"

You certainly can when it's Kopp Glass. That's because Kopp is specifically designed and custom-made to provide optimum dependability and safety under the most severe service conditions.

Kopp "flying" glassware is carefully engineered to give you the best in beam control, color transmission, weather resistance and any other desirable characteristic. An excellent service record both on airplanes and on airports has been the result.

But Kopp engineers aren't resting on these achievements. They're pressing forward relentlessly—piercing safety barriers—to improve existing products and develop new ones. Call today if you have a technical glass problem. Our engineering department will be glad to help you.

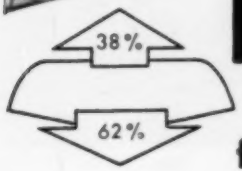
KOPP GLASS

KOPP GLASS, Inc.

Swissvale, Pennsylvania

New! DAYSTAR

THE BIG CHANGE IN FLUORESCENT LIGHTING



A NEW DIRECT--INDIRECT LUMINAIRE
for 4 ft. 430 M.A. Rapid Start and 4 & 8 ft. Slimline Lamps

Now Lighting Products Inc., pacesetter to the lighting industry, presents **DAYSTAR** a revolutionary new luminaire designed for better lighting in class rooms, offices, commercial and industrial areas . . . wherever high levels of quality illumination are desired.

The New **DAYSTAR** is available in 48 and 96 inch length with 35° crosswise and 25° or 45° lengthwise shielding. 62% of the light is directed down and 38% up.

The side panels are of steel or plastic. The steel panels are permanently attached. The polystyrene plastic panels are readily removable without the use of tools. Eight foot units utilize both side panels and louvers that give an uninterrupted continuity of design. Louvers have a special snap-in catch and are suspended from the channel by safety chains for ease of relamping and maintenance. All metal parts are finished in high reflectance baked white enamel over a phosphatized surface.

The New **DAYSTAR** is completely described and illustrated in color bulletin No. 1503.

MAIL COUPON TODAY!

LIGHTING PRODUCTS INC., Dept. 6-K, Highland Park, Ill. No. 1503

Name_____

Address_____ City_____ State_____

Certified Lighting for a Better America

LPI

LIGHTING PRODUCTS INC., Highland Park, Illinois

If your fluorescent lamp sizes are on

THIS LIST

then there now are ballasts to give you up to

One Third More Light!

DOUBLE-LONG LAMP LIFE!

Westinghouse

HIgh-EFFiciency BALLASTS

are co-ordinated to specific electrical requirements of each particular fluorescent lamp!

If your fluorescent lamps are on this list (at right) then you, too, can save *appreciable* amounts of money! — in lighting costs! — in prolonged lamp-life!

This is possible because *all* fluorescent lamps require ballasts *specifically suited* to *each* lamp's *own particular* operating characteristics!

Ballasts *unsuited* to given lamps can *reduce their light-output one-third!* — can *often* cut *lamp-life in half!* And the same is true of ballasts seemingly "matched" well enough — but not manufactured up to the standards necessary for those included in the Westinghouse HIgh-EFFiciency BALLAST list!

So, have your ballasts checked — at *the very first good opportunity!* — for *all three* of the following seals that distinguish *economical* ballast performance!

J-04421

This Underwriters Laboratories Seal means that the ballast on which it appears is electrically *safe!*

This Certified Ballast Manufacturer's Seal means that the ballast meets rigid technical operating requirements.

This Westinghouse seal means that ballasts so identified *fulfill or exceed all CBM requirements!* — are warranted the distinction of inclusion on the Westinghouse HIgh EFFiciency BALLAST list — *yet cost no more* than ballasts that *may* be *wasting 1/3 your lighting potential! — that may be "killing" your lamps mid-way in their service life! Look* for the *Westinghouse* seal!

YOU CAN BE SURE... IF IT'S Westinghouse

Westinghouse

HIgh-EFFiciency BALLASTS

available now for all the following lamps:

LAMP TYPE	LAMP WATTS	CIRCUIT VOLTAGE
preheat		
40T12	1-40	118 v
40T12	2-40	118 v
40T12	2-40	277 v
40T12	3-40	118 v
90T17	2-90	118 v
90T17	2-90	265 v
90T17	4-90	265 v
rapid start		
40T12 rs	1-40	118 v
40T12 rs	1-40	265 v
series • 430 ma		
40T12 rs	2-40	118 v
40T12 rs	2-40	277 v
series • 800 ma		
48T12 rs	2-60	118 v
48T12 rs	2-60	277 v
96T12 rs	2-100	118 v
96T12 rs	2-100	265 v
slimline — 425 ma		
48T12	1-38	118 v
48T12	1-38	265 v
72T12	1-55	188 v
72T12	1-55	277 v
96T12	1-74	118 v
96T12	1-74	277 v
lead-lag		
48T12	2-38	118 v
48T12	2-38	277 v
72T12	2-55	118 v
72T12	2-55	265 v
96T12	2-74	118 v
96T12	2-74	265 v
series		
72T12	2-55	118 v
72T12	2-55	277 v
96T12	2-74	118 v
96T12	2-74	265 v

For special requirements not listed above, contact your nearest Westinghouse office or your own local Westinghouse Distributor.

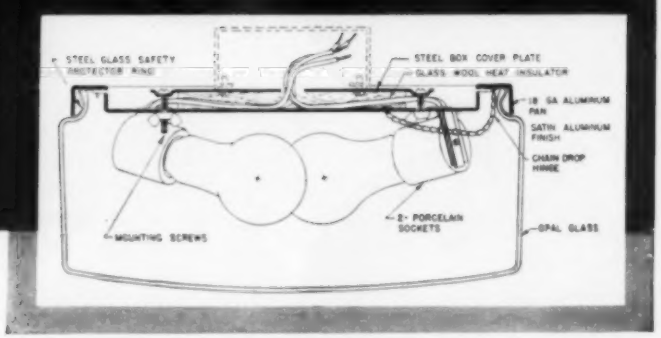
Announcing . . .

a new hinged design*

in ceiling

pan fixtures by

PERFECLITE



Perfeclite now offers a new **hammer lock** design in incandescent ceiling pan lighting fixtures. No other ceiling pan fixture on the market today has all these engineering features:

- Globe opens on **hinge** for quick easy cleaning and relamping.
- Unique **safety locking fitter** holds globe in place without bothersome screws, unsightly extensions or trick springs. Globe is secured with lugs by simple twist of the wrist.
- Lip of globe is completely protected against breakage by a **steel protector ring.**
- Provides **ceiling illumination** as well as **evenly distributed floor lighting.**
- Minimum amount of metal, maximum amount of glass results in **highest light efficiency.**

Here is a unique ceiling pan fixture design for either commercial or residential installation. For further information send for The Perfeclite Data Sheet 56-C today.

Perfeclite's new **hammer lock** fixture is available in the following sizes:

Model	Glass Diameter	Wattage
HH-9	8"	2- 40 W
HH-11	10"	2- 60 W
HH-13	12"	2- 75 W
HH-15	14"	2-100 W
HH-17	16"	3-100 W

Send for new Perfeclite Catalog 956 giving full information on our entire line of Commercial Incandescent Fixtures and Exit Units.

Fixtures are Underwriters Laboratories, Inc. approved.

*Patent pending

THE PERFECLITE COMPANY

1457 East 40th Street • Cleveland 3, Ohio

☐ Please send me The Perfeclite Data Sheet 56-C.

☐ Please send me the new Perfeclite Catalog 956.

Name.....

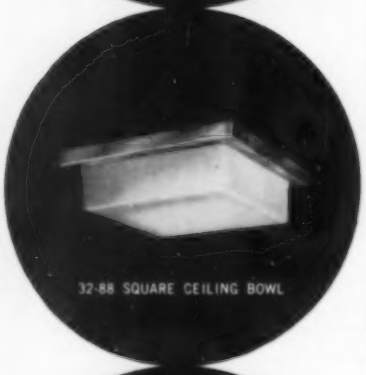
Address.....

City.....State.....

PERFECLITE PRODUCTS

THE MARK OF LIGHTING SERVICE

lighting design by mcPhilben



cast aluminum quality

Permanent satin finish . . . maintenance-free operation . . . durability . . . these are some of the inherent advantages of mcPhilben cast aluminum lighting units. McPhilben quality construction and built-in extras can help solve many of your lighting problems.

Write today for specification data on mcPhilben's cast aluminum quality line.

McPhilben Lighting Co.
1329 Willoughby Avenue
Brooklyn 37, New York

SEE OUR CATALOG IN SWEET'S FILE

(*Continued from page* 42A)

GRAVES, LESTER H. (1945), 33 Loma Media Road, Santa Barbara, Calif.

HAMEL, J. SAMUEL (1957), 234 S. Buena Vista, Burbank, Calif.

JONES, J. ROY (1957), Westinghouse Electric Corp., 600 St. Paul Ave., Los Angeles, Calif.

SHEPHERD, THEODORE H. (1957), Dept. of Water & Power, P. O. Box 3669, Terminal Annex, Los Angeles 54, Calif.

SOUTHERN COLORADO CHAPTER

KRAEHENBUEHL, JOHN OTTO (1948), Colorado College, Colorado Springs, Colo.

TAR HEEL SECTION

PALMER, ROY A. (1954), Duke Power Co., Power Bldg., Charlotte, N. C.

TORONTO SECTION

BATEMAN, JOSEPH W. (1953), Canadian General Electric Co., Ltd., 211 King St. W., Toronto, Ont.

DEAN, GEORGE FRANKLIN (1956), Toronto Hydro-Electric System, 14 Carlton St., Toronto, Ont.

LOVE, ROBERT M. (1946), Canadian General Electric Co., Ltd., 940 Lansdowne Ave., Toronto, Ont.

MUDGETT, GUERNSEY F. (1946), Canadian Westinghouse Supply Co. Ltd., 195 Fleet St., E. Toronto, Ont.

FOREIGN NON-SECTION

WALDRAM, J. M. (1952), Regional Laboratories of General Electric Co., Ltd., Wembley, England.

Next National Technical Conference
Toronto, Ontario, Canada

Next year's National Technical Conference will be August 17-22, 1958, in Toronto. Already an enthusiastic Conference Committee is laying plans for a highly valuable technical program, and for interesting trips throughout this interesting city. High on the list of things to see will undoubtedly be the renowned "Casa Loma" — a medieval castle within a modern city. Built at the turn of the century by Sir Henry Pellatt, this famous Toronto landmark is now a favorite tourist attraction. A towering castle on a hill in the heart of Toronto, this fabulous building will intrigue visitors with many beautiful features. Each of its 98 rooms has its own fascinating feature — from the great bronze Italian Renaissance doors, through the mahogany parqueted Great Hall, stain-glass domed Conservatory, and panelled studies, complete with secret panels and concealed stairs.

No member of I.E.S. should miss next year's Conference.

August 17-22, 1958
Royal York Hotel

Obituary

Robert G. McPhail of the Holophane Company, Inc., Newark, Ohio, died June 24 following an illness of several months. Mr. McPhail, 65, was designer of prismatic lighting equipment for Holophane since 1944. Long a major contributor to illuminating engineering knowledge and to lighting literature, Mr. McPhail's latest work was presented before the National Technical Conference of I.E.S. this month, in Atlanta. An abstract of his I.E.S. Conference paper appears on page 471 of this issue. Mr. McPhail was widely known as a lecturer, and many of his papers have been published in ILLUMINATING ENGINEERING.

Deaths

M. B. Beck, President of Silvray Lighting, Inc., Bound Brook, N. J.

Paul T. Owens, Milwaukee Section.

C. E. Romberger, Eastern Pennsylvania Section.

George J. Stephenson, San Diego Section.

Arthur A. Wanty, Milwaukee Section.

ABOUT PEOPLE

Several new appointments have been announced by Day-Brite Lighting Inc. **James A. Reeves** now represents the company in the Denver area. Previous to his Day-Brite appointment, he spent 12½ years as a salesman and lighting engineer with Meletio Electric Supply Company in Dallas. **Judson H. (Jud) Lord** has joined H. C. King & Associates, Day-Brite representatives, in Ohio, to service the Columbus area. Mr. Lord comes to the company after six years with Graybar in Columbus, and more recently, five years as Manager, Lighting Sales, Ohio Valley District of Graybar, Cincinnati. As of June 1, **Frank A. Coley** was appointed lighting representative for Day-Brite, covering eastern New York State, with headquarters in Syracuse. For the past nine years he has been Supply Salesman in Charge of Sales at Graybar, Erie.

Two promotions in the executive staff of Benjamin Electric Manufacturing Company, Des Plaines, Illinois, have been announced by Hoyt P. Steele, President. **George F. Niemann** has been named Director of Manufacturing. **Benjamin S. Benson, Jr.,** formerly Chief Illuminating Engineer of Benjamin, has been promoted to the newly created position of Director of Engineering. Mr. Benson will be completely responsible for all engineering activities of the company and report directly to the President.

(*Continued on page* 64A)

L&P Fluorescent Fixtures

THE PEABODY OPEN

A highly recommended industrial unit, excellent for modern uplight installations — now available with new power groove, the new lamp with high lamp output. Write today for price sheet.

In the Spotlight
FOR SEPTEMBER

This L & P fixture is only one of Light & Power's complete line of fluorescent fixtures—with fine material, expert craftsmanship and quality control built into every unit. The result? Dependability, beauty and efficiency ... every time!

LIGHT & POWER UTILITIES CORP.

Distributed by Electrical Wholesalers Only

Write or wire today for catalog and prices.

LIGHT & POWER UTILITIES CORP.
1035 Firestone Blvd., Memphis, Tenn.

EASY READING

means less strain on young eyes. Only best quality light is suitable for our schools and **Kurt Versen's concentric ring** fixtures provide glare-free, shadowless illumination. Only Kurt Versen has:

91% efficiency
Rustproof all aluminum hangers
Hang-straight swivels* with 56° swing
Threadless, twist-lock connections
On-the-job adjustable stem lengths
Low temperature ventilated husks

Kurt Versen's complete selection of concentric ring fixtures are an industry standard . . . known for quality . . . yet priced among the lowest. Catalog on request.

kurt Versen COMPANY
contemporary lighting
ENGLEWOOD 20, NEW JERSEY

NEW EQUIPMENT DATA
AVAILABLE WITH COUPON

New manufacturers' catalogs and bulletins listed below are available free to readers of ILLUMINATING ENGINEERING by mailing the coupon. Circle the numbers of those items which you want, drop in envelope or fasten securely to back of 2-cent postcard addressed to Publications Office.

1 New catalog on LUXAIRE and CIRCLELUX fluorescent luminaires for street, highway and area lighting describes and illustrates new ways in which low, medium and high intensity outdoor lighting can be achieved, shows new ideas in photos and drawings. Pfaff and Kendall, Newark, N. J.

2 400-page Catalog No. 55 covers overall line of fluorescent and incandescent lighting fixtures for industrial and commercial requirements; features new slim dimension latchless fluorescent troffers as well as accent lights in decorator colors. Complete specifications and illumination data are given. Ruby-Philite Corp., Long Island City, N. Y.

3 New 4-page brochure describes VHO (Very High Output) fluorescent lamp and depicts typical uses such as outdoors for floodlighting, billboards and streets, and indoors for high and low bay industrial installation and commercial uses. Sylvania Electric Products Inc., Salem, Mass.

4 New catalog displays comprehensive line of recessed downlights and domes, and other incandescent luminaires as well as wall and table portable lamps; is completely indexed and includes information on construction, illumination and installation data; shows units in use. Kurt Versen Co., Englewood, N. J.

5 Four-page, two-color folder describes ADJUST-O-MATIC, new RLM industrial luminaire with novel, finger-tip uplight control which adjusts amount of light without use of tools. Folder gives specifications and illumination data. Ender-Monarch Corp., Westbury, N. Y.

6 New specification sheet gives details on HIBAY, mercury vapor unit for high mounting use; shows photometric test report results and tells of outstanding features. Holophane Co., New York, N. Y.

7 Bulletin GED-3164 is an eight-page report on ballast sound, describes how research and manufacturing processes contribute to combatting noise in fluorescent ballasts; also company's new sound rating calculator. General Electric Co., Schenectady, N. Y.

8 Punched catalog page No. 535A covers LUV-R-LOK series 170 said to be a 100% cleanable luminaire; tells of removable louvers and other complete specifications, including photometric and installation data. Lighting Products Inc., Highland Park, Ill.

Offer good for two months only

Circle numbers wanted. Enter name and address. Clip out and mail.

PUBLICATIONS OFFICE 9-57
ILLUMINATING ENGINEERING SOCIETY
1860 Broadway
New York 23, New York

Send me items circled below:

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13	14	15	16	17	18	19	20	21	22	23	24

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

9 Bulletin L157P, completely illustrated 28-page brochure, gives full information on features, ratings and data of a new line of compact, self-contained packaged LUXTROL light control assemblies for use in theaters, churches, schools, etc. Superior Electric Co., Bristol, Conn.

10 Folio 57-5 describes a wide range of corrosion-resistant recessed incandescent lighting units for installation in either concrete pourings or plaster ceilings; with extra shallow housings for typical locations such as canopies, vestibules, etc. McPhilben Mfg. Co. Inc., Brooklyn, N. Y.

11 Folder and catalog sheet give details on SOUNDSHEET, new plastic laminate, said to combine successfully for the first time efficient acoustical properties with quality illumination characteristics; designed for use in over-all lighting systems, either already installed or in planning stage. Contrex Co., Chelsea, Mass.

12 New complete catalog is said to contain all technical information needed to calculate practically any incandescent lighting job; contains lumen and other charts, photos, interflection coefficient tables, cp distribution, brightness and all data on company's BRASCOLITE line. Edwin F. Guth Co., St. Louis, Mo.

13 HAZARD FINDER, eight-page illustrated folder contains check list of 13 questions to determine whether uncontrolled flammable gases, vapors, dusts, liquids or other combustible materials make an area unsafe. Unique feature is sealed section for evaluating after all questions are answered. Crouse-Hinds Co., Syracuse, N. Y.

14 Bulletin No. 104 covers new luminaire for landscape lighting and parking areas, furnishes complete specifications and recommendations as to mounting pole type and height. Philadelphia Electrical and Mfg. Co., Philadelphia, Pa.

15 Four new catalogs show the complete line of company's lighting fixtures, including one for residential units and three covering new commercial and industrial fluorescent line; give complete descriptions and technical data. John C. Virden Co., Cleveland, Ohio.

16 Brochure EPFF-1 gives detailed information on the four types of company's FOTOFORM glass; how they are made, how they differ, their specific and potential uses and design and production data on each. Corning Glass Works, Corning, N. Y.

(Continued on page 67A)

Introducing NEW

DIRECT-THE-LITE

ADJUSTABLE

Floodlight Reflectors

. . . designed for specific area floodlighting and controlled general illumination. New DIRECT-THE-LITE units by Novelty are recommended for churches, public buildings or commercial application wherever higher intensities are required. Spot lamps or floodlamps may be used, and they are adjustable both horizontally and vertically, approximately 35°. Write for new illustrated folder.

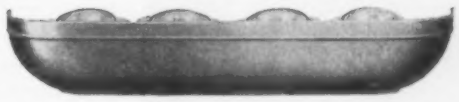
New Lighting Ideas for

- Restaurants
- Lounge Bars
- Stage Lighting and TV
- Theaters
- Churches (Chancel)
- Arcades
- Display Windows
- Store Fronts

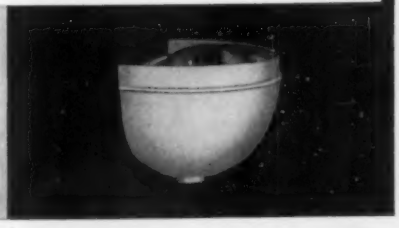
NO. CH 215

APPROVED BY UNDERWRITERS' LABORATORIES, INC.

NO. 8264
Furnished in prime coat for painting to match wall or sprayed finish. (Available with two, three or four lamps.)



NO. 8251
Alumac finish. Canopy mounting.



NO. 8260
Furnished in prime coat for painting. Keyhole slots and center lockup.

NL Corporation
formerly The Novelty Lighting Corp.

2490 East 22nd Street
Cleveland 15, Ohio

to establish atmosphere and mood or to dramatize a display, nothing is more effective than color . . . And when we think of colored light, we do not mean violent purples, magentas and greens . . . Instead, we urge a subtle and convincing use of tonality — we call it "color conditioning". Century equipment includes a growing variety of color media and our staff has had valuable experience to share with you in how they are used.

CENTURY LIGHTING, INC.

521 WEST 43rd ST.
NEW YORK 36, N. Y.

1820-40 BERKELEY ST.
SANTA MONICA, CALIF.

1477 N.E. 129th ST.
N. MIAMI, FLORIDA

(*Continued from page* 61A)

C. T. Ball has been appointed Eastern zone manager of Northern Electric Company Ltd., with headquarters in Montreal. He will be responsible for the sales division's operations in the Province of Quebec and the Maritime Provinces.

NL Corporation is the new name of the Novelty Lighting Corporation of Cleveland, Ohio. Management, officers, personnel and policies remain the same.

Fred J. Bertolone has been appointed Sales Engineer in the San Francisco district for Fluorescent Fixtures of California. Mr. Bertolone succeeds **Milton C. Very** who was recently assigned to the position of Texas District Sales Manager for the company. **William L. Eliot,** the company's field engineer in lighting, has been named to service the Oakland and East Bay territories. Other promotions announced by Fluorescent Fixtures are **Marvin Ray** to Assistant Regional Sales Manager, and **Aubrey C. Rolfe** as Quotations Manager. All of these promotions were effective August 1.

The General Electric Company's Large Lamp Department at Nela Park, Cleveland, Ohio, has named four employee to executive positions in its marketing organization. Appointees and their new titles are: **Willard C. Brown,** Manager, Lighting Education; **Arthur C. Barr,** Manager, Application Engineering; **Joseph B. Foley,** Manager, Commercial and Industrial Sales; and **Samuel H. Hazleton,** Manager, Mohawk Sales District, Albany, N. Y.

Several changes in officers of Silvray Lighting, Inc., Bound Brook, New Jersey, have been announced following a meeting of the firm's Board of Directors. **James M. Gilbert,** former Executive Vice-President, becomes President to succeed the late **M. B. Beck.** Mr. Beck was a founder of the company and had served as President until his recent death. **Henry G. Clum** becomes Vice-President. **Stuart S. Gilbert** was appointed Treasurer, and **E. C. Fortenbaugh** was named Assistant Treasurer.

C. Gus Grant has been appointed manager of marketing at the General Electric Company's Ballast Department, Danville, Illinois. Mr. Grant succeeds **E. C. Schorr** who has been named marketing Consultant for the department.

Walter G. McKie, General Sales manager of the Rochester Gas and Electric Corp., Rochester, N. Y., has been elected Bureau Chairman and Chairman of the Executive Committee of Better Light Better Sight Bureau for the two-year term commencing July 1. Mr. McKie replaces **H. A. Stroud,** Promotion Manager of Monongahela Power Company. The announcement was made at a recent meeting of the Bureau Executive Committee at the Greenbrier, White Sulphur Springs, West Virginia.

Ruby-Philite Corporation, Long Island City, N. Y., have appointed **Bill English Associates,** Denver, Colorado, as their sales representatives for Colorado, Wyoming, New Mexico, Utah, Montana and Western Nebraska. For the state of Oklahoma, the company has appointed as their representative, **Charles E. Prutsman,** of Tulsa. The **Ray Miller Company,** with headquarters at Kirkwood, Missouri, will represent the company in the Arkansas, southern Illinois and west Missouri territory.

Vernon L. Wrye has recently been appointed District Sales Representative for the John C. Virden Company, in the Middle Atlantic states. Mr. Wrye will be headquartered in Philadelphia, to promote Virden sales in eastern Pennsylvania, Maryland, Delaware, central and southern New Jersey, and portions of the metropolitan New York area.

William G. Darley, consulting engineer San Antonio, Texas, has been elected President, Bexar Chapter of the Texas Society of Professional Engineers. Mr. Darley is also currently Chairman of the Alamo Section of I.E.S.

George D. Billock, Vice-President and Treasurer of Hubbard and Company, has been appointed to a newly-created position of Vice-President and assistant to the President. **Marshall S. Delavan** has been elected Vice-President and Treasurer and will assume the positions previously held by Mr. Billock.

Moe Light has named **Dale Gunther** sales representative for an Eastern territory to include Delaware, South New Jersey, Maryland, Washington, D. C., and parts of Pennsylvania. Moe Light is a division of Thomas Industries Inc., Louisville.

Frank Ogden has been named to the new post of marketing manager of the Westinghouse miniature lamp department. Mr. Ogden will be responsible for broad phases of marketing miniature lamp products including automotive lamps, headlamps, aviation and marine, flashlight bulbs, switchboard and panel lamps and Christmas-tree lamps. His office will be at the company's lamp division headquarters in Bloomfield, New

(*Continued on page* 67A)

Employment Opportunities

DISTRICT SALES MANAGER

Leading Manufacturer of Fluorescent Lighting Fixtures, with headquarters in Boston Area, has unusual opportunity for a District Sales Manager in the central Western area with headquarters in Chicago, and one in Southeastern area with headquarters in Atlanta.

Needed are men aged 35 to 45, willing to travel, familiar with territory, college graduates with engineering degree preferable, but not essential. Top-line promotional and selling experience necessary with ability to direct and supervise the area selling force, which sells through electrical wholesalers, and does promotional work among architects, engineers, and electrical contractors.

Liberal compensation, expenses, with bonus set-up. In reply; please give age and experience details. All replies held in strict confidence. Box No. 318, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N.Y.

ASSISTANT TO VICE-PRESIDENT

To work in New York office on scientific information in the field of illuminating engineering. Public speaking and technical writing skills desirable. Real opportunity for right person. Salary commensurate with experience and background of applicant. Give full particulars in writing on qualifications, personal history, salary requirements. Holophane Company, Inc., Dept. R, 342 Madison Ave., New York 17, N.Y.

REPRESENTATIVE WANTED

Top, RLM approved, industrial, incandescent and mercury vapor lighting line, seeks energetic representation with strong architectural and engineering, as well as good distributor contacts. This is an opportunity to become associated with a line that can reward a conscientious effort. The following territories are open: Iowa, Minnesota, Montana, Nebraska, North Dakota, Ohio, Western Pennsylvania, South Dakota, Wisconsin, Utah. Address Box 317, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N.Y.

LIGHTING SALES ENGINEERS

N. Y. manufacturer desires lighting sales engineers with following among architects, engineers, distributors, etc. Quality line of commercial and institutional lighting fixtures. Holophane licensee. National distribution. Many territories open. Forward complete resume. State lines now carried. Address Box 306, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

SALES REPRESENTATIVE WANTED

For New York State (exclusive of metropolitan New York City). Territory also available New Jersey, Delaware and Maryland. Territory changes being made by leading manufacturers of lighting for the Church, School, Hospital, Commercial, etc. Territories now productive and line is specified extensively. Address Box 310, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

DESIGNER DRAFTSMAN

Experienced in lighting fixture design and layout for commercial and institutional use. Excellent opportunity. Submit full resume, background, salary, etc. All replies held strictly confidential. Address Box 305, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

REPRESENTATIVE WANTED

Specific territory open. Sales representative or sales organization wanted to contact architects, engineers, contractors and electrical distributors to sell nationally known commercial, industrial and institutional lighting line, meeting today's competition and tomorrow's future design. We are Holophane licensees and members of the RLM Standards Institute. Due to our new accelerated sales program, many new territories are open (protected). We have just completed our 1957 catalogue which is ready for national mailing. Kindly contact Box 277, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y

LIGHTING ENGINEERS

Westinghouse leadership in a rapidly expanding lighting industry creates a real need for experienced sales engineers. Prefer men who can be ready for assignment in one of our key field offices after a brief indoctrination at Cleveland. Position involves an interesting combination of creative sales engineering, sales promotion and administrative work. Excellent opportunities for advancement. Send resumes to Westinghouse Electric Corp., Lighting Division, 1216 W. 58th St., Cleveland 1, Ohio. Attention: Sales Manager.

LIGHTING SALES REPRESENTATIVE

To call on architects, engineers, wholesalers, contractors, etc. Complete line of commercial and industrial fluorescent and incandescent lighting equipment sold through electrical wholesalers only. Progressive sales and advertising policy; commission basis. Ohio, North Carolina, South Carolina, Georgia and Florida now open. Furnish complete resume including lines now carried. Address Box 316, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

OUTSTANDING OPPORTUNITY FOR ENTERPRISING REPRESENTATIVES

Our client, a nationally known manufacturer of custom built and standard fluorescent and incandescent lighting fixtures, seeks experienced men with knowledge of commercial lighting applications as well as custom built lighting. Must have favorable contacts with architects, engineers, contractors and electrical distributors in their territories. They must also have adequate personnel to cover these lucrative territories: New York State, Michigan, and Georgia-Alabama. If you qualify, write George N. Kahn Co. Inc., 350 Fifth Ave., New York 1, N.Y.

ANNOUNCING

R. D Burnham and Associates P.O. Box 702 Lorain, Ohio

lectrical and Lighting Consultants WOodward 7-4101

A dynamic new engineering group

Centralized design, development and application can reduce your high engineering overhead . . . gives you top engineering talent as you need it.

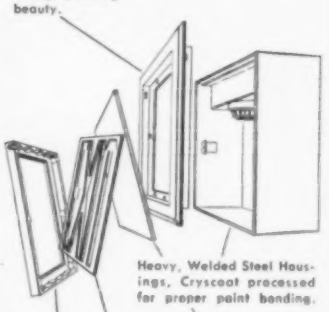
1. Applied illuminating engineering-special problems-surveys
2. Design of lighting equipment
   - Production units for manufacture
   - Custom designs for special application
3. Foremost in the new field of high frequency lighting
4. Complete electrical engineering service for new buildings.

FOR **EXIT LIGHTING**

PRESCOLITE IS PREFERRED

HERE'S WHY...

"Dielux" Diecast Frames precision made for strength, lasting beauty.



Heavy, Welded Steel Housings, Cryscoat processed for proper paint bonding.

Die cut Metal Letter Stencils.

Unbreakable Fiberglas Lens Panels—6 color combinations.

Diecast Frame Inner Section with concealed hinge swings out for easy access to interior.

These features and many others make PRESCOLITE Exit Lights the finest on the market today.

R-50 RECESSED EXIT

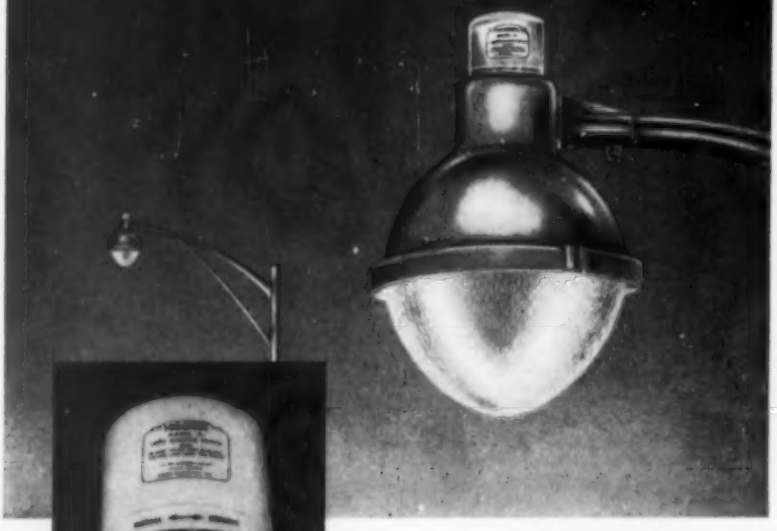
P-54-L PENDANT MOUNT EXIT ARROW TO LEFT

ST-55-D TRIANGULAR WALL MOUNT EXIT WITH DOUBLE ARROWS

Write for your copy of catalog on complete line of PRESCOLITE Lighting Fixtures.

PRESCOLITE MANUFACTURING CORP.
2229 4th St. Berkeley 10, Calif
Easton Road, Neshaminy, Penna

TUBELESS
STREET LIGHTING CONTROL



Installation is simple and inexpensive on any luminaire, cross-arm or pole. Maintenance is negligible, as proved by installations in every climate. The unit is weatherproof and will not crack or discolor. It is lightweight and small in size: 4" dia. x 3⅞" high. Just 20 ounces!

You can solve most of your street and highway lighting control problems with the new LUMATROL® MODEL R TUBELESS AUTOMATIC LIGHT SWITCH. That's because most control troubles are directly traceable to vacuum tubes.

LUMATROL® MODEL R achieves maximum reliability by sensing light with a hermetically sealed cell instead of the usual Phototube, and using a plug-in Electrostatic Relay in lieu of a conventional vacuum tube for switching the circuit.

WRITE, CALL OR WIRE FOR LUMATROL MODEL R BULLETIN 101

micro balancing
INCORPORATED
GARDEN CITY PARK, L. I., NEW YORK
® Trade Mark Reg. U.S. Pat. Off.

INDEX TO ADVERTISERS
September 1957

Advance Transformer Co.	1A
Bakelite Company, Div. of Union Carbide Corp.	44A
Benjamin Electric Mfg. Co.	Back Cover
R. D. Burnham & Associates	65A
Century Lighting Inc.	64A
Certified Ballast Manufacturers	Inside Back Cover
Corning Glass Works	14A-15A, 48A
Day-Brite Lighting Inc.	41A
Garden City Plating & Mfg. Co.	43A
General Electric Co., Acces. Equip.	54A
General Electric Co., Apparatus	20A-21A
General Electric Co., Lamp	4A
Gibson Manufacturing Co .	16A
Edwin F. Guth Co.	Inside Front Cover
Holophane Co. Inc.	22A
Jefferson Electric Co.	47A
Kopp Glass Inc.	56A
KSH Plastics Inc.	28A
L.B.Q.	5A
Light & Power Utilities Corp.	61A
Lighting Products Inc.	57A
Lightolier	46A
Litecontrol Corp.	6A
Litecraft Manufacturing Corp.	50A
McPhilben Lighting Co.	60A
Metalcraft Products Co. Inc.	45A
Micro Balancing Inc.	66A
Miller Company	36A
NL Corporation	63A
Perfeclite Company	59A
Pfaff & Kendall	33A
Phoenix Glass Co.	52A
Photo Research Corp.	67A
Pittsburgh Reflector Co.	51A
Prescolite Manufacturing Corp.	65A
Rambusch Decorating Co.	55A
Revere Electric Mfg. Co.	53A
Rohm & Haas Co.	38A-39A
Smithcraft Lighting Div.	13A
Smoot-Holman Co.	27A
Sola Electric Co.	68A
Starring & Company Inc.	2A
Sunbeam Lighting Co.	34A
Sylvania Electric Products Inc.	19A, 49A
Kurt Versen Company	62A
John C. Virden Co.	30A-31A
Westinghouse Electric Corp., Lamps	24A-25A
Westinghouse Electric Corp.,	

New Equipment Data

(Continued from page 63A)

17 Eight-page catalog shows specially-designed downlites and decorative church lighting fixtures, including domes and wall urns, as well as 60-degree ROTO-SPOT and the self-diffusing ANNU-LITE; gives distribution curves and other data. Rambusch Decorating Co., New York, N. Y.

18 Bulletin SL-56 covers engineered lighting and control equipment for school stages and presents in four parts the principles for selection of equipment; schematic layouts; schedules of equipment to meet various budgets; and description of company's equipment for schools. Hub Electric Co. Inc., Chicago, Ill.

19 4-page, fully-illustrated folder depicts new lighting installation in Norwalk offices of Connecticut Light and Power Co.; shows new trends in fixture design and placement for seeing requirements in various areas of the building. Fullerton Mfg. Co., Norwalk, Conn.

20 Catalog 5-2 describes PARAGRID-TILE, a new polystyrene material for luminous ceilings, said to combine desirable aesthetic qualities, permanency and long life, with a revolutionary suspension technique which cuts installation costs in half. J. A. Wilson Lighting & Display Inc., Erie, Pa.

21 16-page bulletin "Color and Transmission Properties of Sharp Cut-Off Red Glass Filters at Elevated Temperatures" contains data said to be of importance ot all engineers and others interested in color signaling. Kopp Glass Inc., Swissvale, Pa.

22 Two-color catalog page shows company's PHI-BETE, a new luminous indirect low-brightness design utilizing fluorescent reflector lamps specifically for classrooms, offices and similar areas; shows illumination and installation data and specifications. Peerless Electric Co., San Francisco, Calif.

23 12-page, two-color folder describes and pictures completely redesigned MILLER-IVANHOE line of incandescent and mercury lighting equipment for industrial installations; gives illumination data and calculations and shows installation features. Miller Co., Meriden, Conn.

24 Four new folders contain complete information on new developments in fluorescent fixture design by company, describing TWOSOME, EXECUTIVE, CIVIC and FREEWAY units, and including lighting characteristics and photometric data, maintenance, mounting, etc. Smithcraft Lighting Division, Chelsea, Mass.

About People

(Continued from page 64A)

Jersey. **William F. Tremmel, Jr.** has been appointed staff assistant to the manager of the Westinghouse large lamp department. His office also will be in Bloomfield, New Jersey.

Commander Dean Farnsworth, Head of the Human Engineering Branch at the Medical Research Laboratory, New London, Connecticut for the past 14 years, has been transferred to the Office of Naval Research in London, England, the assignment starting August 1st. He will be Scientific Liaison Officer with specialties in color, vision and illumination.

Gerard J. Wendelken has been named Vice-President and General Manager of the American Searchlight Corp., New York, N. Y. In addition to directing the company's program of research and development, Mr. Wendelken will be in charge of the production of giant solar energy furnaces and ultra-high temperature electric arc mechanisms.

Sylvania has announced the appointment of **Samuel H. Eaton** as manager of special accounts for the company's Lighting Division. Mr. Eaton, who replaces the late **Ben Dahlin,** will continue to have his headquarters at Sylvania's Regional sales office in Chicago, Illinois.

Paul P. Twomey has been appointed manager of distribution cost control for the Lighting Division of Sylvania Electric Products Inc., with headquarters at the division offices in Salem, Mass.

Professor Burgess H. Jennings, Evanston, Illinois, has been appointed Director of Research for the American Society of Heating and Air-Conditioning Engineers, according to an announcement by ASHAE President P. D. Gordon, New York, N. Y.

Robert I. Bull, system commercial sales supervisor for the Ohio Power Company, with headquarters in Canton, Ohio, has been promoted to commercial manager of the company's Southern Division. The appointment is effective September 1. In his new position he will be located at Newark, Ohio and will be in charge of all commercial, industrial, residential and agricultural sales activities of the company in the division.

Sameo, Inc., has been appointed sales representative for Globe Lighting Products, Inc., of New York, it has been announced.

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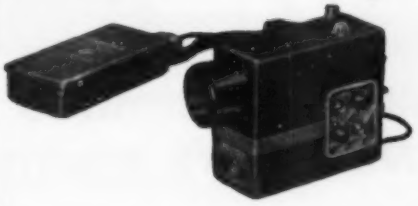

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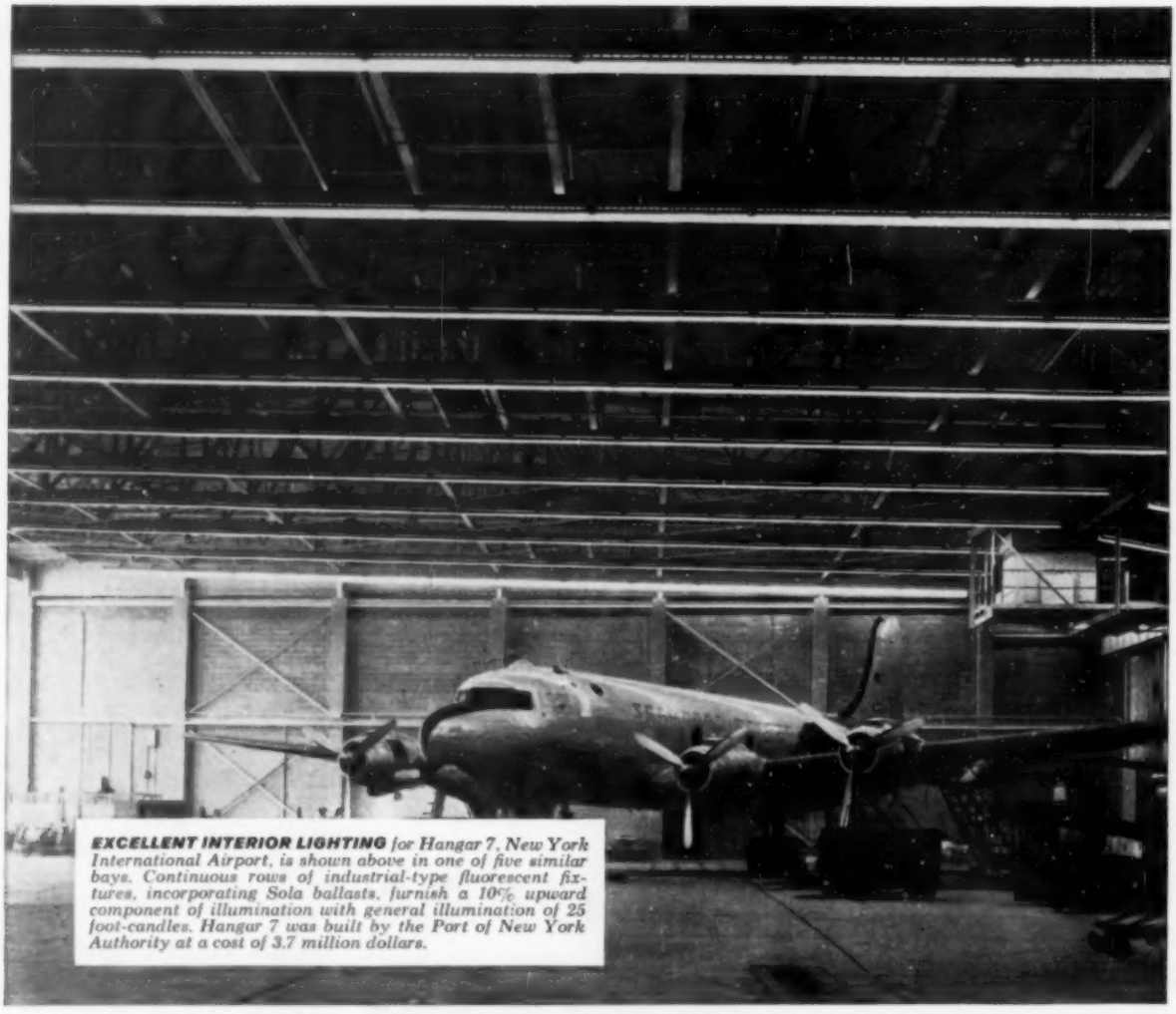

***EXCELLENT INTERIOR LIGHTING** for Hangar 7, New York International Airport, is shown above in one of five similar bays. Continuous rows of industrial-type fluorescent fixtures, incorporating Sola ballasts, furnish a 10% upward component of illumination with general illumination of 25 foot-candles. Hangar 7 was built by the Port of New York Authority at a cost of 3.7 million dollars.*

Sola-ballasted slimline lamps light Hanger 7, New York International Airport

Hanger 7, New York International Airport, depends on fluorescent lamps for maintaining optimum inside lighting conditions. Its 480 luminaires, equipped with slimline warm-white lamps, provide illumination for 156,445 square feet of floor space. Reliable starting and dependable sustained operation of these lamps is achieved by the use of Sola ballasts exclusively.

Electrically and mechanically, Sola ballasts are premium-grade units, designed to meet or exceed lamp manufacturers' standards for optimum performance. With Sola ballasts, rated lumen output, rated lamp life, and long ballast life are assured.

If you manufacture fixtures, or specify, operate or maintain lighting installations, it will pay you to investigate the advantages of Sola Fluorescent Ballasts — and the new *Sola Ballast Service Plan*. Your area representative is part of the nationwide sales organization maintained to provide you with prompt service.

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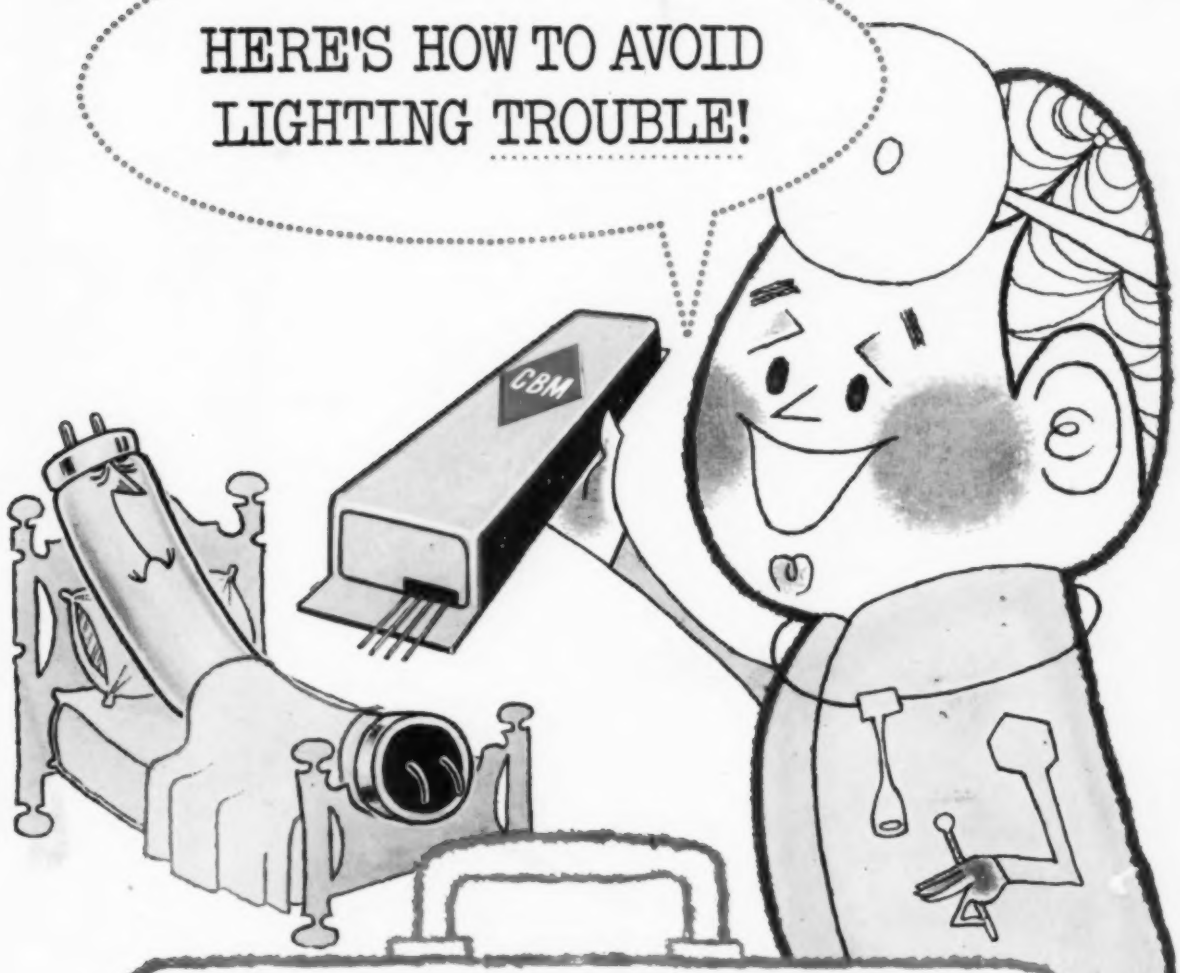
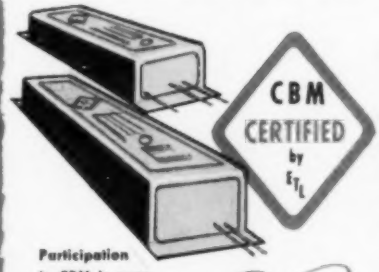
HERE'S HOW TO AVOID LIGHTING TROUBLE!



Poor ballasts can cost up to 30% loss in light output . . . shorter lamp life and shorter ballast life . . . so

Insist on CERTIFIED CBM *Ballasts in Fixtures*



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For Certified Ballasts are made to exacting specifications "tailored to the tube" and checked by Electrical Testing Laboratories. And they're *all* U.L. approved. Assure top performance . . . insist on Certified Ballasts in fixtures.

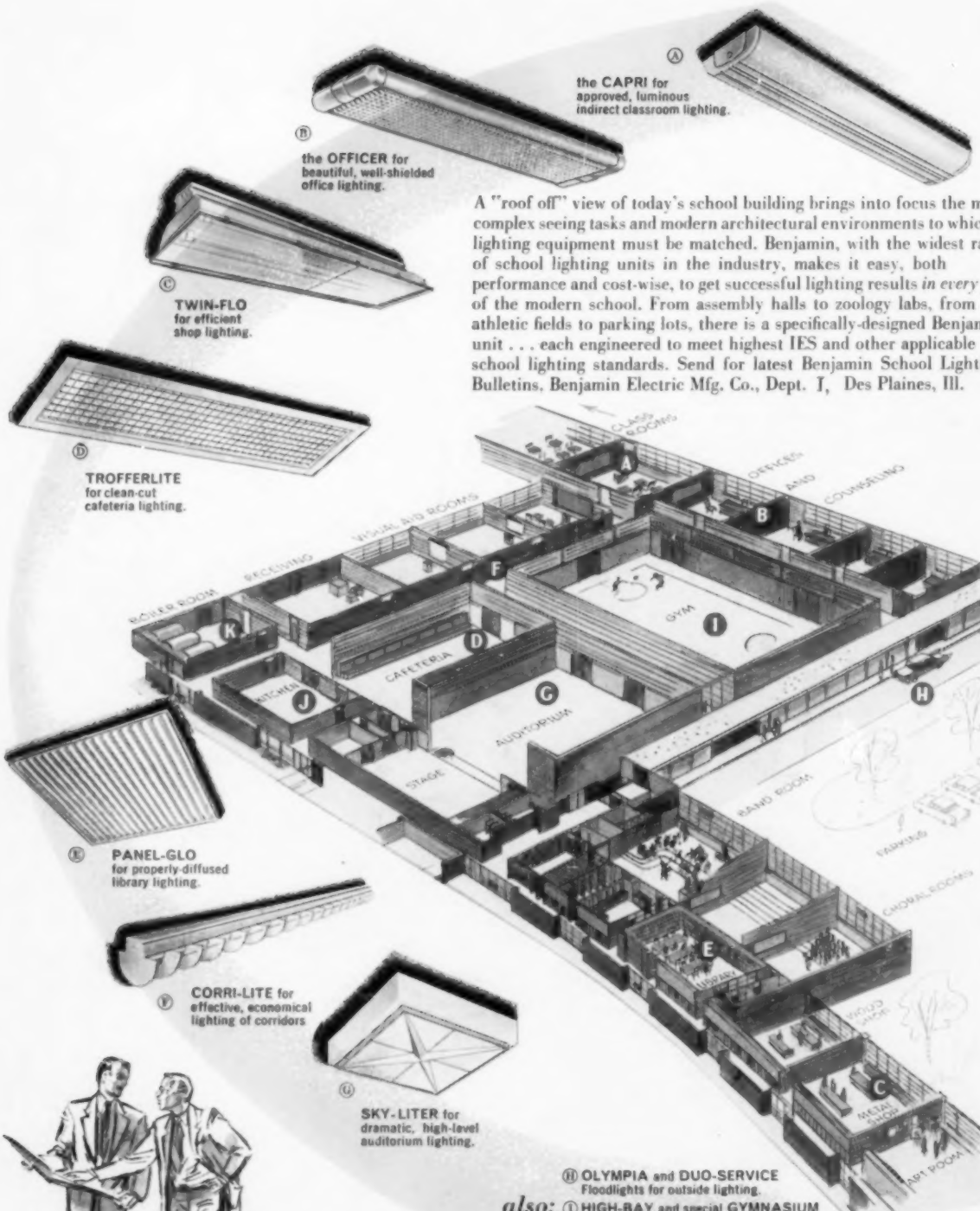
Write for a copy of the new booklet that gives you the low down about approvals on ballasts.

Seven leading manufacturers now make up

CERTIFIED BALLAST MANUFACTURERS

2116 KEITH BUILDING CLEVELAND 15, OHIO

CBM 2-E



A "roof off" view of today's school building brings into focus the many complex seeing tasks and modern architectural environments to which lighting equipment must be matched. Benjamin, with the widest range of school lighting units in the industry, makes it easy, both performance and cost-wise, to get successful lighting results *in every part* of the modern school. From assembly halls to zoology labs, from athletic fields to parking lots, there is a specifically-designed Benjamin unit . . . each engineered to meet highest IES and other applicable school lighting standards. Send for latest Benjamin School Lighting Bulletins, Benjamin Electric Mfg. Co., Dept. I, Des Plaines, Ill.

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R-130